

**Report**  
**On**  
**Development of Conceptual Framework**  
**For**  
**Renewable Energy Certificate Mechanism for India**

**Submitted to**  
**Ministry of New and Renewable Energy**  
**(Government of India)**

**Prepared by**



**ABPS Infrastructure Advisory Private Limited**

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## ABBREVIATION

|         |   |
|---------|---|
| CEA     | Central Electricity Authority               |
| CERC    | Central Electricity Regulatory Commission   |
| CUF     | Capacity Utilisation Factor                 |
| DERC    | Delhi Electricity Regulatory Commission     |
| DMRPS   | Dynamic Minimum Renewable Purchase Standard |
| EA 2003 | Electricity Act 2003                        |
| FOR     | Forum of Regulators                         |
| GW      | Giga Watt                                   |
| KWh     | Kilo Watt Hour                              |
| MNRE    | Ministry of New and Renewable Energy        |
| MW      | Mega Watt                                   |
| MWh     | Mega Watt Hour                              |
| NAPCC   | National Action Plan for Climate Change     |
| NEP     | National Electricity Policy                 |
| OA      | Open Access                                 |
| ORER    | Office of Renewable Energy Regulator        |
| PV      | Photo Voltaic                               |
| RE      | Renewable Energy                            |
| REC     | Renewable Energy Certificate                |
| RLDC    | Regional Load Despatch Centre               |
| RO      | Renewable Obligation                        |
| ROC     | Renewable Obligation Certificate            |
| RPS     | Renewable Purchase Specification            |
| RPO     | Renewable Purchase Obligation               |
| RPC     | Regional Power Committee                    |
| Rs      | Rupees                                      |
| SERC    | State Electricity Regulatory Commission     |
| SLDC    | State Load Despatch Centre                  |
| SNA     | State Nodal Agency                          |
| STU     | State Transmission Utility                  |
| UI      | Unscheduled Interchange                     |



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## **1. Executive Summary**

National Action Plan for Climate Change (NAPCC) announced by the Hon. Prime Minister of India on June 30, 2008 envisages several measures to address global warming. One of the important measures identified involves increasing the share of renewable energy in total electricity consumption in the country. NAPCC has set the target of 5% renewable energy purchase for FY 2009-10 against current level of around 3.5%. Further, NAPCC envisages that such target will increase by 1% for next 10 years. This would mean NAPCC envisages renewable energy to constitute approx 15% of the energy mix of India. This would require quantum jump in deployment of renewable energy across the country. Here, it should be noted that, in India, small hydro plants with capacity of less than 25MW are considered as renewable. Strong policy measures and proactive regulatory framework and innovative financing instruments would be required, if the desired level of penetration of renewable energy is to be achieved. One such policy instrument prescribed in NAPCC is **Renewable Energy Certificate (REC) Mechanism** which would enable large number of stakeholders to purchase renewable energy in a cost effective manner.

Accordingly, **Ministry of New and Renewable Energy (MNRE)** initiated a study to develop such mechanism and mandated **ABPS Infrastructure Advisory Private Limited (ABPS Infra)** to develop 'Conceptual Framework for Proposed REC Mechanism in India'. While developing the Conceptual Framework for the development of REC Mechanism in India, ABPS Infra has studied the existing REC schemes prevailing in various countries, their applicability and relevance with respect to India. Further, ABPS Infra has identified the various options for the development of REC Mechanism in India upon detailed consultation with various experts. ABPS Infra has also deliberated the proposed scheme at FOR - Task Force for Renewable Energy Certificate mechanism and has carefully considered their view point while finalising the scheme. This document presents the important features of the proposed conceptual framework for REC Mechanism in India.

### **1.1 Drivers for REC Mechanism in India**

Although India is abundantly gifted with variety of renewable energy (RE) sources, not all States are endowed with same level of renewable energy sources. While some States have very high renewable energy potential, some States have very little renewable energy potential. The Electricity Act 2003 (EA 2003) stimulated the development of RE based power generation by mandating **State Electricity Regulatory Commissions**

(SERC) with the function of RE promotion within the State. Under EA 2003, the SERCs set targets for distribution companies to purchase certain percentage of their total power requirement from renewable energy sources. This target is termed as **Renewable Purchase Obligation (RPO)**. However, there are certain limitations of State specific approach when RE development strategies are to be deployed at national level.

Existing legal framework under EA 2003 puts responsibility for promotion of renewable energy on SERCs. As a result, the regulations developed by the SERCs differ from each other on many counts. Further, these regulations do not recognize purchase of renewable energy from outside the State for the purpose of fulfilment of RPO target set by the SERC for the distribution utility in the State. The requirement of scheduling and prohibitive long term open access charges poses major barrier for RE abundant States to undertake inter-State sale of their surplus RE based power to the States which do not have sufficient RE based power. Consequently, the States with lower RE potential have to keep their RPO target at lower level.

In addition, the unit cost of the RE based non-firm power is higher than the conventional power sources. As a result, while RE abundant States have no motivation to produce RE based power more than that required to satisfy the RPO mandate within the State. On the other hand, RE scarce States are not able to procure RE generation from other States.

## 1.2 Possible Objectives for REC Mechanism in India

If the challenges mentioned above are analyzed, it can be construed that a mechanism which will enable and recognize the inter-State RE transactions is critically required for further promotion and development of RE sources. Such a mechanism will also enable all the SERCs to raise their States' RPO targets even if necessary resources are not available in their own State. While effective implementation of inter-state transactions would be primary objective for the REC mechanism in India, some of the other objectives identified for REC mechanism are:

- Effective implementation of RPO regulation in all States in India
- Increased flexibility for participants to carry out RE transactions
- Overcoming geographical constraints to harness available RE sources
- Reduce transaction costs for RE transactions



- Create competition among different RE technologies
- Development of all encompassing incentive mechanism
- Reduce risks for local distribution licensee.

### 1.3 Approach and Methodology

Renewable Energy Certificate (REC) mechanism is a market-based instrument to promote renewable energy and facilitate renewable energy purchase obligations amongst various stakeholders. RECs have been used extensively as a successful market based policy instrument to promote renewable energy in many countries, such as Australia, Japan, US, Netherlands, Denmark and UK. However, these schemes vary in detail and need to be customized for local legislations and market situations. Further federal structure of governance as found in India and electricity being part of the concurrent list poses unique challenges for development of such scheme.

Accordingly, we recognized that involvement of various stakeholders such as State Electricity Regulatory Commissions, State Utilities, RE developers, etc. in the development and implementation of REC Mechanism was essential. As a result, we have adopted a consultative approach, which is significantly different from the typical desktop study approach usually adopted for such studies. The approach adopted for development of Conceptual Framework for REC Mechanism in India has been elaborated under Chapter-2.

Further, ABPS Infra was invited to make presentation before Forum of Regulators and subsequently before Task Force constituted by FOR on Renewable Energy Certificate Mechanism. The detailed deliberations and suggestions made during FOR meeting held at Chennai on January 30, 2009 and Task Force meeting held at Delhi on March 2, 2009 have also been taken into consideration while finalising the proposed REC mechanism.

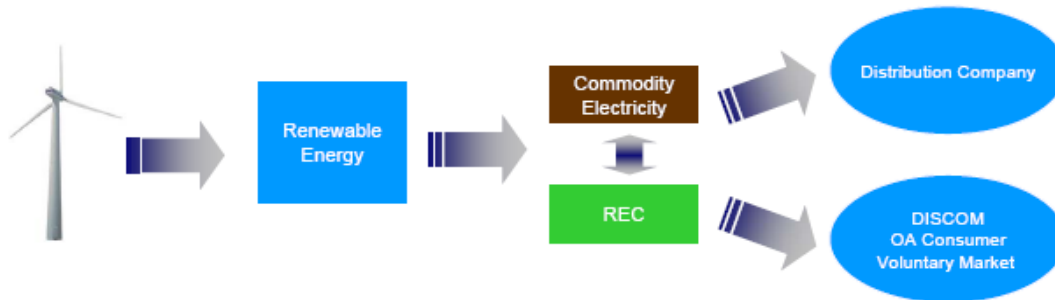
### 1.4 Overview of REC Mechanism

Internationally, purchase of REC is deemed as purchase of power generated from RE sources. It is acknowledged that renewable energy generation entails production of certain environmental attributes apart from electricity generation *per se*. Thus, RE generator can sell two different products on account of renewable energy generation. These products are the electricity and the environmental attributes associated in the form of RE Certificate. It is proposed to adopt the same philosophy for REC mechanism in India.



The schematic in Fig 1.1 presents the concept of REC mechanism and also represents the revenue model for the RE generator in the context of REC mechanism.

*Fig. (1.1): Concept of REC mechanism*



In the proposed mechanism, one REC will be issued to the RE generator for one MWh electrical energy fed into the grid. The RE generator may sell electricity to the distribution company and associated RECs to the distribution company or any other obligated entity. The RE generator may sell RECs to the entities with RPO target in the State or outside the State. The entities with RPO target, such as distribution companies and other entities which are required to purchase Renewable Energy have been referred to as 'Obligated Entities' in the further discussion. The purchase of RECs will be deemed as a purchase of power generated from renewable sources and accordingly will be allowed for compliance the RPO target. The REC mechanism will enable Obligated Entities in any State to procure RECs generated in any of the States in India and surrender the same to satisfy its RPO target.

Thus, REC mechanism will address the issues of scarcity of RE sources in some of the States which currently have negligible RPO targets in view of the limited RE potential in the State. In addition, in RE rich States, the REC mechanism will reduce the risks for Obligated Entities in continued procurement of renewable power beyond their RPO targets.

### 1.5 Important features of REC mechanism

1. REC mechanism is *NOT* an incentive scheme. Rather it will enable sale and purchase of renewable component across the State boundaries.
2. REC mechanism will coexist with all current incentive based schemes, since most of these schemes are based on certification of generation.



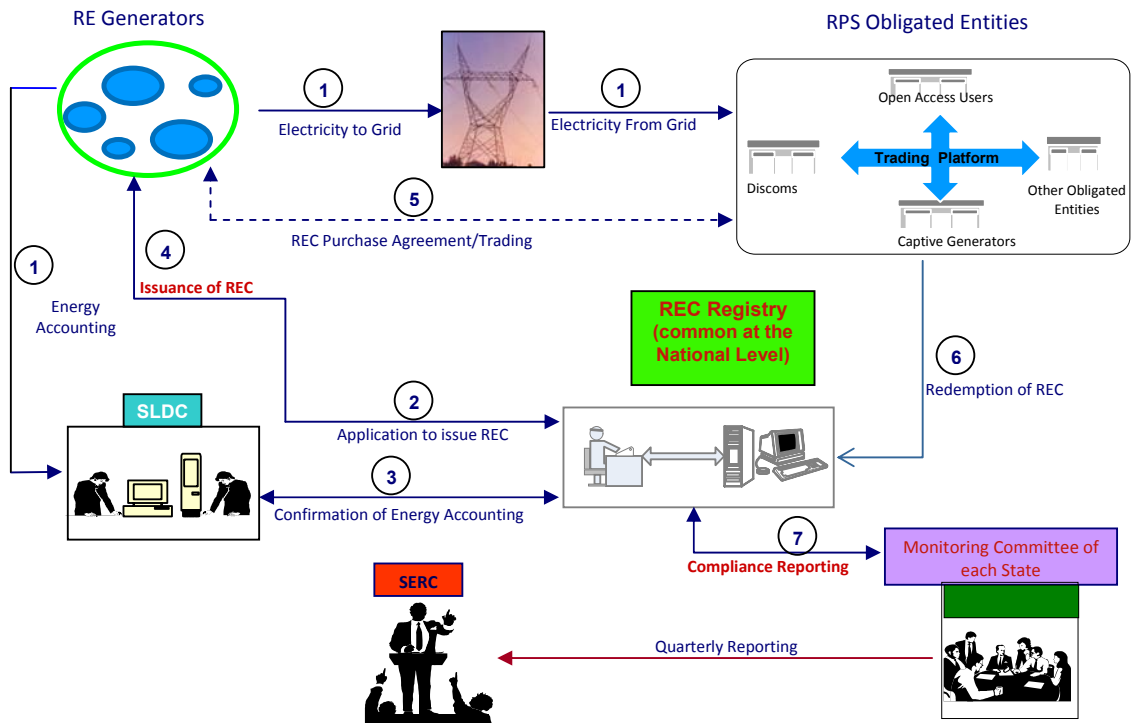
3. RE Certificate will not represent any fiscal attribute such as 'Accelerated Depreciation', hence it will be different than Production Tax Credits.
4. Though REC represent environmental attribute, it will not be related to carbon credits. These two mechanisms will operate independent of each other.

## 1.6 Overview of Proposed Operational Framework for REC Mechanism

The operational scheme for the Proposed REC Mechanism has been developed taking into consideration experiences of prevalent RE based tradable certificate schemes in countries such as United Kingdom, Australia, etc. Although all the operational frameworks are similar in principle, the countries have customized the operational schemes to comply with the prevalent legal and regulatory framework. The operational framework for India as presented below has also been customized to comply with existing legal and regulatory framework in India.

The schematic in Figure 1.2 represents a flow diagram for various processes involved in the REC mechanism. The numbers indicate the chronological sequence of seven identified key processes.

Fig. (1.2): Schematic of Operational Framework for REC Mechanism



The operational framework depicted above does not envisage any major modification to the existing arrangements for renewable energy procurement. The proposed framework entails appointment of an agency at national level to facilitate the registration of eligible RE generators, issuance of RECs and maintenance of record of procurement of RECs by Obligated Entities.

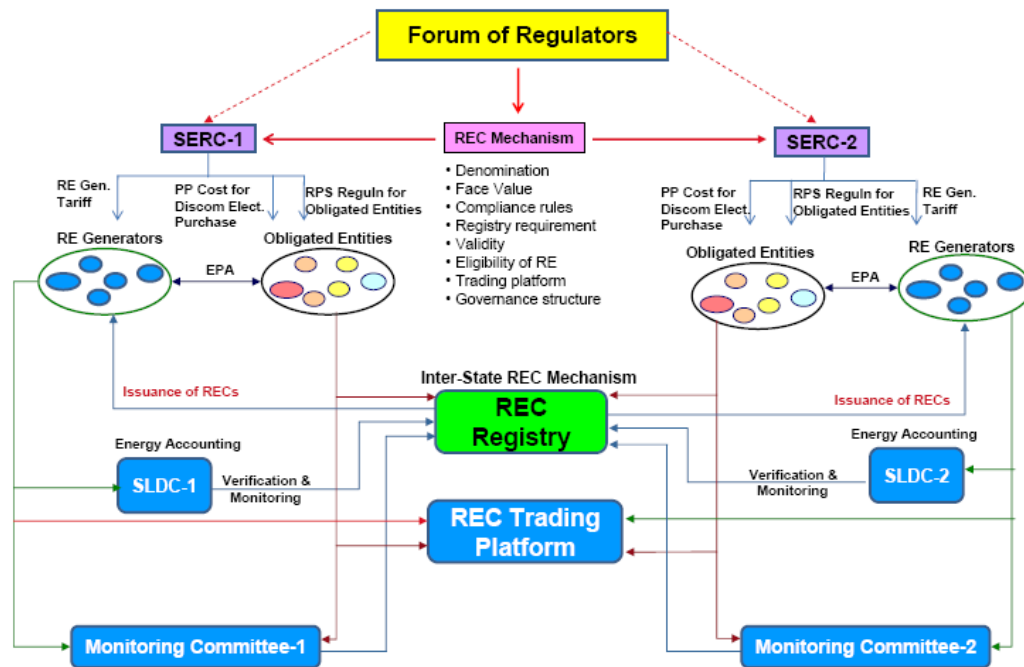
As depicted from the schematic above, the State Load Dispatch Centres (SLDC) and proposed new institutions such as National level REC Registry and State level Monitoring Committees will play the pivotal role in day-to-day operation of REC mechanism. The success of the proposed REC mechanism will depend on adoption of precise definition of the roles and responsibilities of these institutions, adoption of the appropriate governance structures and capacity building to undertake defined roles and responsibilities.

To implement the proposed REC mechanism at the national level, the above mentioned operating framework needs to be put in place in various States. Here, it may be noted that the REC registry and REC Exchange platform will be common at the national level.

### 1.7 Institutional Framework for the Proposed REC Mechanism

The schematic diagram at Figure 1.3 below presents the institutional framework for implementation of the proposed REC mechanism.

Fig. (1.3): REC Mechanism: Institutional Framework at National Level



For successful implementation of the proposed REC mechanism, regulatory oversight through Forum of Regulators (FOR), various State Electricity Regulatory Commissions (SERCs) and Central Electricity Regulatory Commission (CERC) will play the pivotal role. It is envisaged that Forum of Regulators shall perform an important task of development of harmonized regulations for implementation of REC mechanism at the State level.

### 1.8 Pricing Options for Electricity and REC components

The REC mechanism entails pricing of two components, namely, electricity component and REC component representing environmental attributes of RE generation. There are multiple options for pricing of 'electricity component' such as market based approach, UI price linked approach, average power purchase cost of utility approach and normative RE feed-in tariff linked approach etc. The



merits and de-merits of various approaches have been discussed in detail under Chapter-8.

Further, REC pricing mechanism in India need to address unique situation where electricity market is still governed/regulated to great extent and the preferential feed-in tariff mechanism will have to continue as per provisions under Tariff Policy. Under the circumstances, REC price will have to be determined on notional basis, however, the same could be discovered through market mechanism based on volume and exchange of RECs.

Based on deliberations covered under Chapter-8, most feasible option for RE pricing is to link the electricity component with normative RE tariff and REC component with notional fixed price. Further, it is important to have focus on the basic purpose of introduction of REC mechanism in India which is to facilitate the inter-State exchange/transactions of RE so that all the States will be able to meet the long term RPS target specified under National Action Plan for Climate Change (NAPCC). This purpose distinguishes REC mechanism proposed for India from that in most of the other countries which rather have their REC mechanism as an incentive mechanism. Therefore, the effective electricity component prices shall be net of notional fixed price for REC component.

|                                    |  |
|------------------------------------|--|
| <b>REC Component Price</b>         | <b>= Notional Fixed Price</b>  |
| <b>Electricity component Price</b> | <b>= Normative RE Tariff - Notional Fixed Price of<br/>REC Component</b> |

The suggested approach seems to be the most feasible solution in the present electricity market scenario. However, with the progressive development of electricity sector, the pricing methodologies for Electricity component and REC component need to be reviewed at periodic interval. After attaining the maturity by RE technologies, both the prices should reach the level of price discovery through the commercial market for electricity as well as REC prices should be determined using market discovery mechanism. The FOR Task Force on REC has supported the proposed approach for pricing of electricity component and REC component.

## 1.9 Key Design Parameters for REC Mechanism

Apart from pricing aspect, several other key design parameters as mentioned below have been evaluated for development of REC mechanism in Indian context.

- **Eligible RE sources and technologies:** As MNRE is nodal ministry for all matters related to renewable energy, it would be preferable to include only those RE technologies in the REC mechanism which are approved by MNRE. Further, in order to harmonise RE eligibility criteria across the States, FOR in consultation with MNRE may issue guidelines for eligibility of RE technologies.
- **Eligible RE generator / Project:** Considering the current status of infrastructure availability, it will be appropriate to focus and give priority to grid-interactive RE technologies only and based on the status after a few years the off-grid RE technologies may be included. This will enable the development of grid-interactive RE technologies up to commercial maturity and then such mature technologies can easily be transferred to the off-grid RE projects. Therefore, it is proposed that grid connected RE projects with 250 kW and above shall be eligible. The FOR Task Force has also concurred with this suggestion and has recommended that the grid connected renewable energy generators of at least 250 kW should be allowed to participate in the REC Mechanism. Existing RE projects have already been covered under particular tariff and regulatory regime. Further, the long term contracts for the same are already put in place. Hence, it will not be appropriate to subject existing RE projects to be part of REC mechanism at this stage. Therefore, it is suggested that existing projects may be allowed to participate in REC scheme after the expiry of their existing PPA. It has also been accepted and recommended by the FOR Task Force that the RE Generators already having PPA with the distribution licensees for contracted quantum would not have option to participate in the REC Mechanism till the validity of their PPA. FOR may develop suitable methodology for inclusion of the existing projects into REC mechanism after expiry of their agreements with the utilities. Further, all new grid connected RE projects, to be commissioned after introduction of REC mechanism, should be covered under REC scheme on mandatory basis. During the discussion with FOR, it has emerged that the new RE generators shall have two options i.e. either to sell both the Electricity and REC Component together at preferential tariff determined by the respective State Regulator or sell only the electricity component to the distribution utilities and to



sell the REC component through the market mechanism to any of the obligated entities.

- **Obligated Entities:** It is recommended that distribution licensee, captive users and open access consumers should be considered as obligated entities for the purpose of RPO target under REC mechanism, in accordance with provisions of Section 86(1)(e) of EA 2003.
- **Shelf life of REC:** The shelf life of REC means the period during which a REC issued shall remain valid. It is proposed that shelf life of REC should be maximum one year. Keeping shelf life more than one year may result into accumulation of RECs by the stakeholders in the expectation of better price in future which may create artificial shortage of REC. The shelf life of more than one year may threaten the liquidity and viability of REC market in the short term. Therefore, it is proposed that shelf life of REC should also be of one year.
- **REC Issuing Authority:** A national level REC Registry has been proposed to be created and CERC may formulate rules for creation of such national level entity in accordance with the harmonized policies to be developed by FOR for operation of REC mechanism at national level.
- **Compatibility with other incentive scheme:** In the proposed REC mechanism for India, RPO and preferential tariff has already been taken into account while detailing out the conceptual framework for REC. It is also important that REC should be compatible with other financial and fiscal incentive schemes already in existence. The Government has announced accelerated depreciation benefits, tax benefits, generation based incentives and capital subsidy to the renewable energy projects. It shall be responsibility of MNRE to ensure that future incentive schemes are compatible with the REC mechanism as REC mechanism is a long term mechanism with validity of 20 years. Further, CDM benefit is also available to renewable energy projects. At present, all these incentives and benefits have direct or indirect impact on the normative preferential tariff announced by SERCs. In the proposed REC scheme, no change has been suggested in the existing methodology used by SERCs for tariff determination hence there will be no impact of the proposed REC scheme on any of the existing incentive schemes and benefits etc.





- **Creation and redemption of RE Certificate:** In Indian context, it is proposed that RECs will be issued to the RE generator for the electricity injected and metered at the bus-bar of the generating station. In cases, where the licensee has already contracted for electricity and REC procurement with the RE generator, RECs will be issued in the name of RE generator and immediately transferred in the name of licensee which has purchased those RECs. This will avoid creation of multiple RECs for same generation. Other issues can be very well addressed by using the appropriate hardware and software having compatibility to modify the processes, with the gain in operational experience. It is also suggested to issue REC only in 'electronic form' and no 'physical form' of REC has been contemplated to avoid hassles of paperwork and also in view of the fact that the security/verification protocols etc can be easily implemented in case of 'electronic form'.

RECs shall be redeemed when RECs are presented to REC Registry for redemption by the owner of RECs or when shelf life of the RECs expires. Whether redeemed specifically or expired due to expiry of life, owner of the RECs shall be allowed to account these RECs for compliance of the RPO.

- **Denomination of RE Certificate:** The RECs are proposed to be denominated in energy (MWh) terms in order to be consistent with RPO percentage obligation to be specified in energy terms. With the proposed denomination in energy terms, SERCs can continue to specify the RPO target as a percentage of energy consumption which can easily be converted into the equivalent number of RECs, by applying some conversion factor, required for achieving the RPO target.
- **Period to issue RE Certificate:** In order to avoid oversupply or non-availability of RECs in the market, it is necessary that generators regularly apply for RECs. Therefore, it has been suggested to keep this period three months of the generation within which RE generator must apply for issuance of RE certificate.
- **Control period, operative period and sunset date:** Control period is a period during which the proposed REC Scheme will be in force while operative period is a period in which projects implemented during control period. Sunset date refers to the date on which scheme expires. It is proposed that the Scheme shall come





into force on April 1, 2010 and control period shall be five years i.e. March 31, 2015. And the sunset date shall be 25 years from the date on which scheme came into force i.e. March 31, 2035.

- **Form of RE Certificate:** Proposed REC needs to contain all the information such as Unique Certificate Number, Name of the Issuing Body, Generator Identity, Type of Generation Technology, Installed Capacity of the Generator, Location of the Generator, Signature of the Authorized person, in its electronic form. In addition information about date of issuance of certificate and validity of certificate may also be provided on the proposed RE certificate.
  
- (a) **Sale and Purchase of REC:** It is proposed that not only obligated entities but also other persons shall be allowed to buy RECs. REC Exchange Platform is expected to provide the services for sale and purchase of RECs. While any trading platform could be used for exchange of RECs, at this point of time there is no clarity about the volume and liquidity in the market. It is suggested that FOR should undertake the assessment of market, liquidity requirements, costs involved in setting up of the market and necessary fee structure. Further, REC Exchange Platform shall have to be developed and the regulations under Section 66 of EA 2003 will have to be framed to cover such exchange/transfer of REC. The Task Force has agreed with the proposal that one single market shall be created in the country for exchange/transfer of REC. However, the difficulties/reluctance being observed on the parts of the States in creation of all India Electricity market for conventional power should be duly taken into consideration while designing the operating rules for exchange/transfer of RECs.



## **2. Introduction**

This Chapter outlines the scope of the study for development of Conceptual framework for REC Mechanism and also covers the methodology adopted, description of processes and inputs received and considered while devising the Conceptual Framework for introduction of REC mechanism in India.

### **2.1 Background**

At the end of 10<sup>th</sup> Five Year Plan, renewable energy capacity in country was 13.2 GW. The 11<sup>th</sup> Five Year (2007-2012) plan envisages addition of renewable energy capacity by 14 GW. While the current efforts to harness renewable energy are targeted to meet State specific objectives, future RE capacity addition will be constrained due to lack appropriate measures to enable inter-State RE transactions. REC mechanism has been widely acknowledged as a potential tool to achieve inter-State RE transactions.

### **2.2 Purpose of the Study**

In the view of NAPCC mandate, Ministry of New and Renewable Energy (MNRE) engaged ABPS Infrastructure Advisory Private Limited (ABPS Infra) to develop suitable conceptual framework for REC mechanism that can facilitate inter-State transactions based on electricity generation from RE sources which will enable the Obligated Entities to fulfill their obligation to purchase power generated from renewable sources.

### **2.3 Scope of Study**

In order to develop Conceptual Framework for REC mechanism, MNRE had outlined following Terms of Reference for the Study.

1. Hurdles faced by RE in India
2. Regulatory developments in India
3. Potential for competitive bidding in RE sector
4. Feasibility of implementation of REC mechanism in India
5. Potential for creating competition among various RE technologies
6. Operational Aspects of REC Mechanism such as:
  - Denomination of RE Certificate
  - Mechanism for stating RPS/RPO in terms of REC
  - Rules for issuance of RE certificate
  - Validity of RE certificate
  - Certificates of Origin

- Registry/Clearing house and rules for the same
  - Energy Accounting and Energy Credit Mechanism to recognize REC
  - Entities to be covered
  - Conformity with other relevant regulations such as Open Access, Grid Code, Scheduling and Dispatch Regulations etc
7. Institutional Mechanisms needed for REC implementation
  8. Legal and Regulatory Issues
  9. Road map for implementation of RECs

## 2.4 Approach and Methodology

Renewable Energy Certificate (REC) mechanism is a market-based instrument to promote renewable energy and facilitate renewable energy purchase obligations amongst various stakeholders. RECs have been successfully used in many countries such as Australia, Japan, US, Netherlands, Denmark and UK for promotion of renewable energy. However, these schemes vary in detail and need to be customized for local legislations and market situations. Further federal structure of governance as found in India and electricity being part of the concurrent list poses unique challenges for development of such a scheme in India.

Accordingly, we recognized that involvement of various stakeholders such as State Electricity Regulatory Commissions, State Utilities, RE developers, etc. in the development and implementation of REC Mechanism was essential. As a result, we adopted a consultative approach, which is significantly different from the typical desktop study approach usually adopted for such studies. We have adopted following approach for development of 'Conceptual Framework for REC Mechanism' in India:

### i. **Stakeholder consultation and identification of key issues:**

A number of States with significant RE potential and with very little RE potential were identified so as to gather views of various stakeholders involved in inter-State RE transactions in these States. The identified States were Andhra Pradesh, Delhi, Gujarat, Karnataka, Maharashtra, and Rajasthan. The stakeholders considered for consultation process in these States covered SERCs, SLDCs, State Transmission Utilities (STUs), State Nodal Agencies (SNAs), distribution licensees, RE generators and their associations, CERC, Regional Load Despatch Centres and Regional Power



Committees (RPCs). A detailed questionnaire was designed and administered for seeking responses from various stakeholders for identifying existing legal, operational, commercial and regulatory issues involved in undertaking inter-State and intra-State RE transactions.

**ii. Identification of Legal and Regulatory Hurdles in REC development:**

The potential legal and regulatory hurdles for proposed REC mechanism were identified. An exhaustive list of these issues was prepared. Their relevance for the REC mechanism was studied. The outcome of this study was useful while devising a suitable regulatory approach for development of appropriate REC mechanism.

**iii. Analysis of International Experience of REC implementation**

Under this module, we undertook comprehensive review of REC schemes implemented in other countries. The evaluation of the features of the REC schemes was carried out in the context of the legal and regulatory framework prevalent in the electricity sector in that country. Also, interplay of REC mechanism with other policy instruments for promotion of RE sources was also studied. This analysis was applied to Indian context to assess the relevance of a particular feature in Indian context.

**iv. Evaluation of options and recommendations:**

It was desired that the proposed REC mechanism should be compatible with the existing policy and regulatory framework. Further any new mechanism it should cause minimal modifications to the existing institutional and operational requirements. Accordingly, various options for introduction of REC mechanism were evaluated and most suitable option has been selected.

**v. Ascertaining feasibility of the proposed REC mechanism**

The proposed solution was presented to MNRE and FOR and deliberated extensively. ABPS Infra was invited to make presentation before Forum of Regulators on January 30, 2009 at Chennai. The presentation covered in detail the proposed conceptual framework for REC mechanism. The FOR has 'in-principle' accepted the proposed conceptual framework for REC mechanism in India and constituted a Task Force to address further operational issues to ensure speedier implementation of the mechanism. The meeting of FOR Task Force was held at Delhi on March 2, 2009 wherein several implementation aspects were deliberated at length.



The feedback and suggestions of the Task Force have been taken into consideration under this Report on REC mechanism for India.

**vi. Design parameters and Salient features of the proposed REC mechanism**

While designing conceptual framework, we have identified several design parameters such as denomination of REC, eligibility of RE technologies, eligibility of RE generators, pricing of electricity component, pricing of REC component, REC registry, transfer/exchange mechanism, shelf-life, sunset date, etc. We have identified various alternatives for each of the design parameters and have assessed merits/de-merits of each alternative before proposing suitable framework for REC Mechanism in India.

**vii. Institutional Set up and identification of roles and responsibilities**

Energy accounting, issuance of REC and monitoring of RPO compliance are critical processes for successful implementation of the REC mechanism. Understanding of the existing processes is very important while developing any new solution. It is necessary to make maximum use of the existing institutions. Accordingly, we have strived to work with the existing institutional set up such as SLDCs, distribution licensees, RLDCs and RPCs for undertaking inter-State energy transactions. However, new institutions such as REC Registry, Exchange platform at national level and Monitoring Committee structure at State level are essential to operationalise the proposed REC mechanism. We have critically evaluated the roles and responsibility of each agency in the proposed REC mechanism.

## 2.5 Organization of this Report

This report has been organized through eleven chapters.

**Chapter 1** provides an Executive Summary of the report.

**Chapter 2** presents the background and purpose of study, scope of study, approach and methodology identified to accomplish the task and outline of the Report.

**Chapter 3** presents the status of grid-interactive RE power generation in India. It highlights the commercial developments in the RE sector and potential market for RECs.



**Chapter 4** highlights the existing legal and regulatory framework, drivers and objective for REC mechanism, concept of RE Certificate and the issues identified in development and implementation of such inter-State mechanism in India.

**Chapter 5** covers the detailed analysis of international REC schemes and identifies the salient features and key design parameters for the purpose of devising REC mechanism in Indian context.

**Chapter 6** presents the potential approach for introducing REC mechanism in India including the institutional requirements, regulatory challenges and outlines possible roadmap for regulatory activities to be undertaken prior to introduction of REC mechanism in India.

**Chapter 7** presents the detailed conceptual framework for REC. It also elaborated on operational framework with step wise analysis of procedures involved in issuance of REC certificate, role and responsibility of each entity involved in the transaction. Further, the step-wise process map from issuance of REC to its redemption has been laid out under this Chapter.

**Chapter 8** elaborates on various pricing aspects of electricity component and REC component under the proposed REC mechanism. Various options available for pricing of electricity component and REC component have been discussed in detail along with their merits/de-merits. A suitable pricing option has been recommended.

**Chapter 9** elaborates on various design features and key parameters for proposed REC mechanism in India context. It also evaluates various alternatives alongwith merits/de-merits in respect of each design parameter.

**Chapter 10** elaborates the next steps to be taken by various stakeholders for implementation of REC mechanism in India.

### **3. Overview of Renewable Energy Development in India**

This chapter presents the overview of renewable energy development in India. The chapter assesses the RE potential to be harnessed in respect of each RE technology. Further, this Chapter also highlights the status of regulatory measures such as RPO regulations and Feed-in tariffs across various States. Finally, this Chapter estimates the potential for RE transactions through REC mechanism.

#### **3.1 RE Development in India**

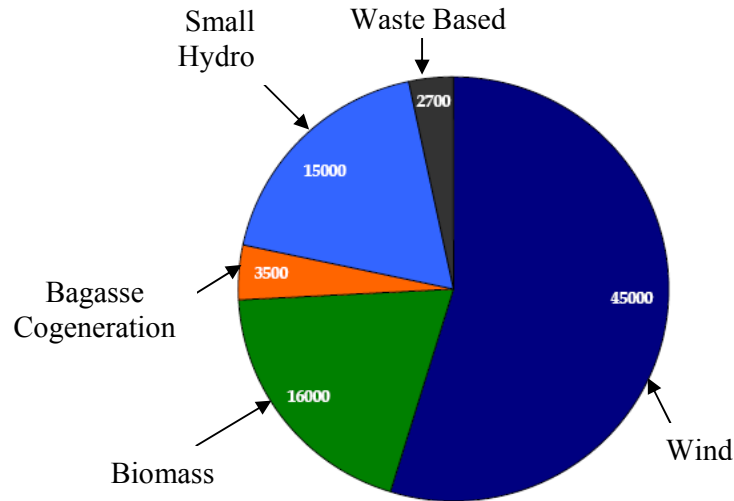
India started its renewable energy program in 1981 with the establishment of Commission for Additional Sources of Energy which was later converted into Ministry of Non-conventional Energy Sources in 1992. In the year 2006 it was renamed as Ministry of New and Renewable Energy (MNRE). Today, MNRE operates one of the world's largest programmes for promotion of RE sources in the country.

This section provides brief information about the technical potential and achievement in terms of cumulative installed generation capacity for each RE source in India. It also highlights the huge gap between India's gross potential and the capacity installed, so as to develop appreciation of the need for development of suitable policy instruments for accelerated development of renewable energy sources in India.

#### **3.2 Technical Potential of Renewable Energy**

India has been bestowed with huge RE potential; however it is not distributed uniformly across the country. Solar, wind, biomass and small hydro are the major RE sources in India. India receives solar energy approximately 5000 trillion kWh/year equivalents, which is far more than India's total energy consumption of about 848 billion kWh as projected for FY 2010 by Central Electricity Authority in its 17<sup>th</sup> Electric Power Survey. The potential of various RE sources excluding solar energy is shown in figure 3.1 below.

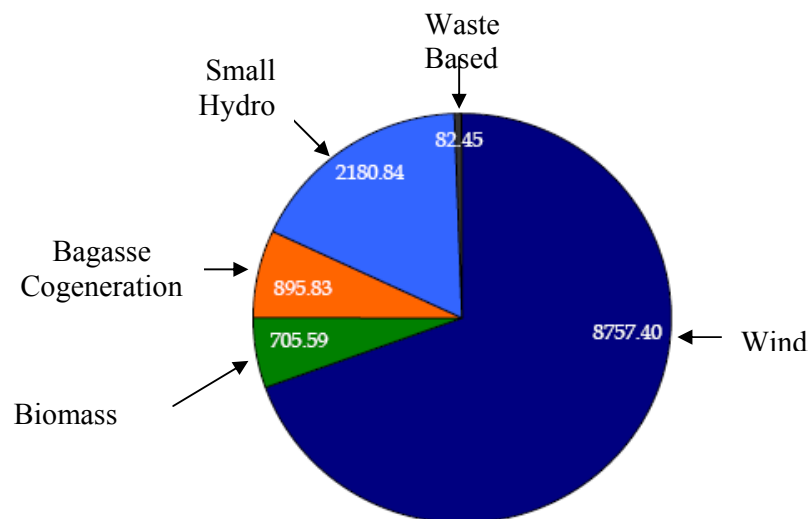
Fig. 3.1: India's Technical Potential of Renewable Power in MW<sup>1</sup>



### 3.3 Renewable Energy Installed Capacity

As it is evident from figure 3.2, the wind energy constitutes largest commercially exploited RE source in India. Further, as per 11<sup>th</sup> Plan projections, the dominance of wind energy within overall renewable energy mix is expected to continue.

Fig. 3.2: India's Installed Capacity of Renewable Power in MW (on March 31, 2008)



The status of potential and installed capacity of each RE resource available in India has been presented below in more detail.

<sup>1</sup> <http://mnes.nic.in> as on January 22, 2009



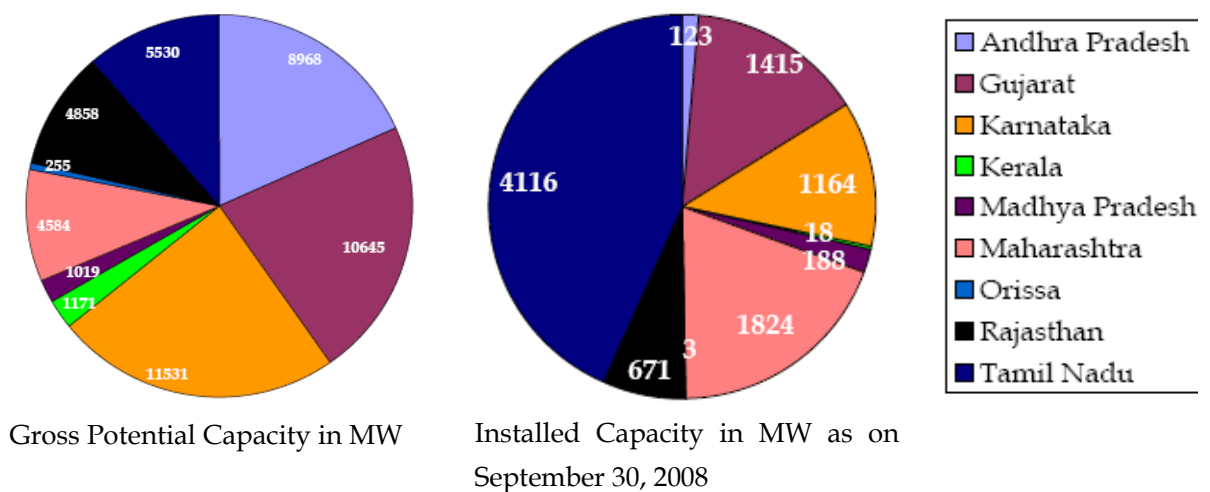
### 3.3.1 Wind

Wind based generation capacity constitutes about 80% of the total renewable energy based installed generation capacity in the country. Wind energy potential is mainly concentrated in the western and southern part of the country due to the better wind regimes in the coastal areas. . The States of Tamil Nadu, Karnataka, Maharashtra, Gujarat, Rajasthan, and Madhya Pradesh have seen significant investments in wind energy generation by private as well as public sector investors.

The 11<sup>th</sup> five year plan has outlined a target of 10,500 MW of capacity addition from wind energy projects. The energy generation is expected to increase at an average growth rate of 9% per annum and is expected to reach 7 billion units during FY2011-12.

The potential and installed capacity in the important States in India has been shown in the figure 3.3.

Fig. 3.3: State-wise Gross Potential and Installed Capacity in MW <sup>2</sup>



### 3.3.2 Biomass power

The table 3.1 below provides information related to the cumulative capacity addition at the end of 10<sup>th</sup> plan and gross potential for the resource for the entire country.

<sup>2</sup> Programmes and schemes for Grid Interactive Renewable Power From <http://mnes.nic.in/> as on January 22, 2009

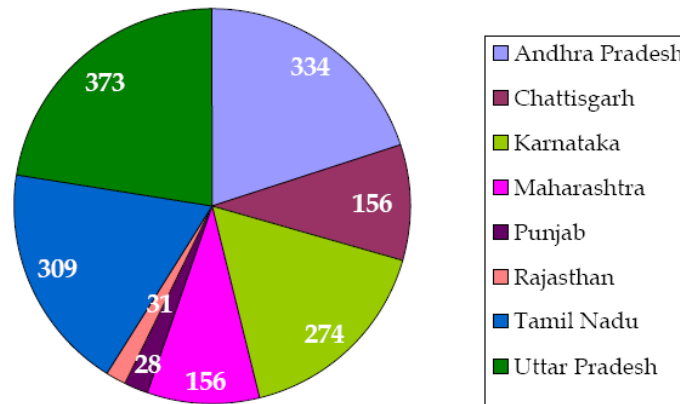
**Table (3.1): India's Biomass Power Generation Installed Capacity & Potential (MW) <sup>3</sup>**

| Sr. No. | Grid interactive Projects                 | Cumulative Installed Capacity (on March 31, 2007) in MW | Estimated Potential in MW |
|---------|---|---|---------------------------|
| 1       | Bio power (agro residues and plantations) | 524.80  | 16881                     |
| 2       | Bagasse Cogeneration                      | 615.83  | 5000                      |

During 11<sup>th</sup> Plan period, capacity addition of around 2100 MW from biomass power and bagasse cogeneration projects has been targeted as against capacity addition of 750 MW achieved during 10<sup>th</sup> Plan.

The State-wise distribution of the installed capacity of biomass and bagasse based cogeneration projects have been shown in the figure 3.4 below.

**Figure (3.4): Biomass based installed Capacity across the Important States till end of FY 2009 <sup>4</sup>**



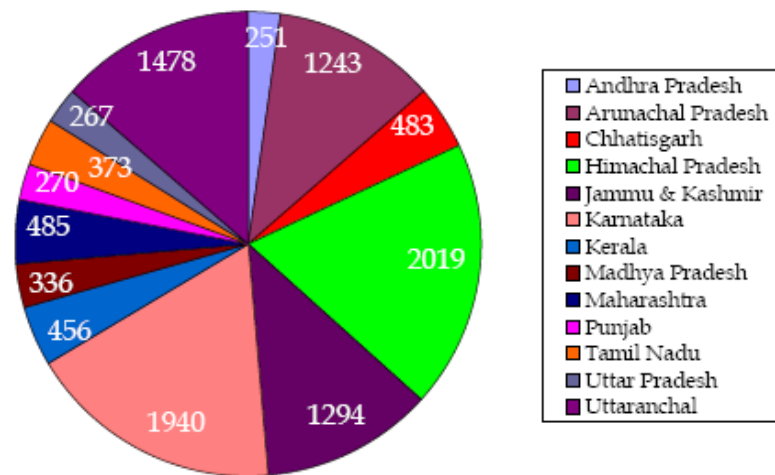
<sup>3</sup> 11<sup>th</sup> Five Year National Plan

<sup>4</sup> Programmes and schemes for Grid Interactive Renewable Power From <http://mnes.nic.in/> as on January 22, 2009

### 3.3.3 Small Hydro Power

In India, the hydro power plants with installed capacity of less than 25 MW are classified as small hydel power plants and therefore considered as a part of renewable generation. The State-wise installed capacity of small hydro power plants is shown in figure 3.5.

Figure 3.5: Small Hydro based installed Capacity (MW) across the Important States as on June 2007<sup>5</sup>



### 3.3.4 Solar Power

Due to geographical location India has many of the abundantly gifted sunny regions of the world. While, the highest annual radiation is received in western Rajasthan, the north-eastern region receives the lowest annual radiation.

Most parts of India receive 4-7 kWh of solar radiation per square meter per day with 250-300 sunny days in a year. India receives solar energy approximately 5000 trillion kWh/year equivalent, which is far more than India's total energy consumption of about 848 billion kWh in FY 2010, as projected by Central Electricity Authority in its 17<sup>th</sup> Electric Power Survey. India has Solar Photovoltaic power generation potential of 20 MW per sq. km while Solar Thermal power generation potential of 35 MW per sq. km. The grid connected installed capacity at the end of 10<sup>th</sup> five year national plan was about 3 MW. It is targeted to add 50 MW during the 11<sup>th</sup> plan. Table 3.2 summarizes the solar based installation in the country.

<sup>5</sup> Programmes and schemes for Grid Interactive Renewable Power From <http://mnes.nic.in/> as on January 22, 2009

Table (3.2): Solar based installation in India (as on March 31, 2008) <sup>6</sup>

| Sr. No. | Particular                                | Unit            | Detail   |
|---------|---|-----------------|----------|
| 1.      | Solar Power                               | MW              | 2.12     |
| 2.      | Solar PV power plants and street lighting | MW <sub>P</sub> | 7.72     |
| 3.      | Solar Lantern                             | Nos.            | 6,70,059 |
| 4.      | SPV Pumps                                 | Nos.            | 7148     |
| 5.      | Solar water heating-Collector Area        | Million sq. m.  | 2.30     |
| 6.      | Solar Cookers                             | Lac units       | 6.34     |

### 3.4 Potential Market for REC in India

In this section, an attempt has been made to estimate the market size for REC Scheme in India. In order to estimate demand for renewable energy, energy requirement as estimated by Central Electricity Authority <sup>7</sup> in its 17<sup>th</sup> Electric Power Survey has been considered. Further, it has been assumed that India will be able to achieve the target set by NAPCC. Renewable energy generation thus available has been compared with the current scenario (RE capacity addition as planned under 11<sup>th</sup> Five Year Plan) to quantify incremental RE generation due to target set out in NAPCC.

Table (3.3): REC Potential Market Assessment

| NAPCC Target implementation scenario      | Unit | 2008-09        | 2009-10        | 2010-11        | 2011-12        |                |
|---|------|----------------|----------------|----------------|----------------|----------------|
| Energy Requirement                        | BU   |                | 848.39         | 906.32         | 968.66         |                |
| NAPCC Target                              | %    |                | 5%             | 6%             | 7%             |                |
| Renewable Energy                          | BU   |                | 42.42          | 54.38          | 67.81          |                |
| Incremental Renewable Energy              | BU   |                |                | 11.96          | 13.43          |                |
| <b>Current Scenario</b>                   |      | <b>2007-08</b> | <b>2008-09</b> | <b>2009-10</b> | <b>2010-11</b> | <b>2011-12</b> |
| Renewable Installed Capacity              | MW   | 10250.0        | 12712.2        | 15765.9        | 19553.1        | 24250.0        |
| CUF 28%                                   | %    | 28%            | 28%            | 28%            | 28%            | 28%            |
| Renewable Energy Availability             | BU   | 25.14          | 31.18          | 38.67          | 47.96          | 59.48          |
| Renewable Energy Availability             |      |                |                | 4.56%          | 5.29%          | 6.14%          |
| Incremental Renewable Energy Availability | BU   |                |                | 7.49           | 9.29           | 11.52          |

<sup>6</sup> Renewable Energy Booklets From <http://mnes.nic.in/> as on December 20, 2008

<sup>7</sup> <http://www.cea.nic.in> as on January 13, 2009



Based on projected RE capacity addition of 14 GW during 11<sup>th</sup> Plan, the total renewable energy installed capacity in the country is expected to increase from 10.25 GW (end of 10<sup>th</sup> Plan) to 24.25 GW (end by 11<sup>th</sup> Plan). Out of projected RE capacity addition plan of 14 GW, significant quantum of RE capacity addition (around 10.5 GW) is expected to be added from wind energy. Thus, at an estimated CUF of 28% on aggregate basis, total renewable energy generation is expected to increase from 38.67 Bn units (2009-10) to 59.48 Bn units (2011-12) which translate to share of RE quantum in overall energy mix to increase from 4.5% to 6.1%, which is marginally lower than the RPO trajectory outlined under NAPCC. Thus, incremental RE generation varies from 7.5 Bn units to 11.5 Bn units. If RECs are proposed to be introduced for new RE projects, this translates to REC market potential of around 8 to 10 Bn units per annum.

As shown in the above table, the market potential assessment for REC has been carried out taking into consideration (a) targets specified under NAPCC and (b) the capacity addition targets envisaged by MNRE. As regards the capacity addition targets specified by MNRE, those were set at the beginning of 11<sup>th</sup> plan considering the significant renewable energy capacity addition during the 10<sup>th</sup> Plan. However, the current economic slowdown has adversely affected the renewable energy capacity addition during the first two years of 11<sup>th</sup> Plan, especially in the wind energy sector. Therefore, in such conditions, actual renewable energy capacity addition may be lower than the targeted capacity addition as envisaged during the 11<sup>th</sup> Plan.

Further, based on earlier experience of operationalising RPO regulations, very few States such as Tamil Nadu, Karnataka, Gujarat etc. have exceeded the minimum targets for RE procurement, whereas many States are yet to achieve the minimum targets. NAPCC has set the target of 5% renewable energy purchase for FY 2009-10 against current level of approx 3.5%. Further, NAPCC envisages that such target will increase by 1% for next 10 years. This would mean NAPCC envisages renewable energy to constitute approx 15% of the energy mix of India. This would require quantum jump in deployment of renewable energy across the country. Strong policy measures and proactive regulatory framework and innovative financing instruments would be required, if the desired level of penetration of renewable energy is to be achieved.

Further, at present, none of the SERCs have specified the minimum RPS targets after considering the targets specified under NAPCC, mainly due to the reason that almost all the Orders/Regulations were framed before issuance of NAPCC. However,



interestingly, the Consultative Papers issued by the SERCs in the recent past for review of RPS/RPO targets also has no mention of the NAPCC target.

Thus, to meet the targets as envisaged under NAPCC, all States will have to undertake comprehensive review of the RPS/RPO Regulations. However, it is unlikely that all States will develop the mandatory RPO/RPS framework before April, 2010 and the obligated entities will actually be able to meet the targets in the short term. Therefore, as a word of caution, the REC market potential assessment on the basis of above two assumptions may lead to most optimistic scenario for near future. A detailed study on REC market potential assessment needs to be carried out after considering the realistic assumptions and ground realities.

### 3.5 Implications of REC Implementation

It may be noted that non-availability of mechanism for inter-state sale and purchase of RE is not the only impediment in the path of achievement of higher targets set out in NAPCC. Many other issues such as increased cost of generation, lack of compliance mechanism, etc would have to be resolved. However, it is believed that lack of coordination among States while setting RPO targets and non-uniformity in procedures and norms for determination of tariffs for various RE technologies are the two most important barriers. It is learnt that CERC has already initiated the exercise to develop norms and regulations for determination of tariffs for renewable energy technologies. Once notified by the CERC, such norms would become guiding factors for all SERCs.

While this will take care of the second problem, the first problem is more fundamental as currently RPO Targets are set without any regard to national target. The currently specified RPO targets vary significantly across the States. At one end of the spectrum, Delhi has target of just 0.5% for renewable energy purchase, while at other end, Himanchal Pradesh has target of 20% for distribution utility in the State. This disparity in targets is a reflection of the varying renewable energy potential in different states. Similar disparity is noted in achievement of the targets or actual injection of renewable energy in the State. While States like Tamil Nadu and Karnataka have achieved target of 10% for renewable energy, many other states are not able to meet target of even 1-2% for purchase of renewable energy. While nothing can be done about the varying renewable energy potential in different states, it may be possible to develop an approach which will enable nation as a whole to achieve the target set under NAPCC.



At present, none of the SERCs has specified the minimum RPS targets after considering the targets specified under NAPCC, mainly due to the reason that almost all the Orders/Regulations were framed before issuance of NAPCC. However, interestingly, the Consultative Papers issued by the SERCs in the recent past for review of RPO targets also has no mention of the NAPCC target.

In theory, all State Regulators can set the renewable target which is equal to the national target under NAPCC. However, such an approach would be futile as the States with little/no RE potential will never be able to procure renewable energy as per the national target. Further, most of the SERCs have specified renewable targets from the short term perspective, primarily due to limitation of in-depth study of renewable energy potential in the State and non-availability of appropriate instrument to allow purchase of renewable energy from outside the State. As a result, it will be difficult to achieve the NPACC target unless some appropriate policy / regulatory instruments are developed. While one of the options would be State level targets being determined by the Central Government, given current legal framework, this is not a feasible option. Therefore, consensus among the SERCs is the only feasible option to achieve the national target. It has been recommended and also acknowledged by the Task Force that in depth consultation with SERCs to arrive at consensus in the matters of setting renewable purchase obligations should be crucial for the success of REC Mechanism. Also, it has emerged during discussion with the Task Force that FOR should evolve state-wise targets for RPS after duly taking into consideration recommendations of achieving the target of 5% as a whole at national level and its likely impact on consumer tariff.

In addition, while NAPCC envisages long term trajectory for RPO targets to be set upto 2020, at present, most of the States have specified RPO targets only for period of 3 to 5 years upto 2010. There are very few States, who have RPO targets specified for period beyond 2012. Thus, in order to achieve objectives outlined under NAPCC, long term RPO trajectory should be specified by all States. It is necessary to develop appropriate regulatory and institutional mechanism to ensure that States determine RPO targets in consultations with each other. , Such consultations may be carried out by the Forum of Regulators which has been entrusted with the responsibility of harmonizing regulatory policies in the country.



## 4. Existing Legal and Regulatory Framework for RE and its Assessment for REC

This Chapter briefly describes the existing legal and regulatory framework in India for promotion of power generation from RE sources. The Chapter will also attempt to present some of the key issues that remain un-addressed.

### 4.1 Existing Legal and Regulatory Framework for Renewable Energy

This section describes the legal and regulatory provisions relevant for promotion of renewable energy based power generation. The section incorporates provisions from EA 2003, National Electricity Policy (NEP), and National Action Plan for Climate Change, and a brief on RPO orders/regulations notified by SERCs.

#### 4.1.1 The Electricity Act 2003

The *Preamble* to the Electricity Act 2003 records the following,

*"An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, **promotion of efficient and environmentally benign policies**, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto."*

Further, the EA 2003 has following provisions for promotion and development of Renewable Energy sources in India.

- **Section 86(1)(e):** The State Commission shall 'promote cogeneration and **generation of electricity from renewable sources** of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for **purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee.**'
- **Section 61(h):** The Appropriate Commission shall, subject to the provisions of the Act, specify the terms and conditions for **the determination of tariff**, and in doing so, shall be **guided by the promotion of co-generation and generation of electricity from renewable sources of energy.**



- **Section 86(1)(b):** The SERCs shall discharge the function to regulate electricity purchase and procurement process of distribution licensees including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for **purchase of power for distribution and supply within the State.**
- **Section 3(1):** The Central Government shall, from time to time, **prepare the National Electricity Policy and tariff policy**, in consultation with the State Governments and the Authority for development of the power systems **based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy.**
- **Section 3(3):** The Central government may, from time to time in consultation with the State Governments, and the Authority **review or revise, the National Electricity Policy and tariff policy** referred to in section 3(1).
- **Section 79(k):** the Central Electricity Regulatory Commission (CERC) shall discharge the functions assigned under the Act.
- **Section 66:** The **Appropriate Commission** shall endeavour to **promote the development of a market (including trading)** in power in such manner as may be specified and shall be guided by the National Electricity Policy referred in Section 3 in this regard.

#### 4.1.2 National Electricity Policy

National Electricity Policy was notified by Central Government in February 2005 as per provisions of Section 3 of EA 2003. The Clause 5.12 of NEP outlines several conditions in respect of promotion and harnessing of renewable energy sources. The salient features of the said provisions of NEP are as follows.

- "5.12.1 Non-conventional sources of energy being the most environment friendly there is an urgent need to promote generation of electricity based on such sources of energy. For this purpose, **efforts need to be made to reduce the capital cost of projects** based on non-conventional and renewable sources of energy. Cost of energy can also be reduced by promoting competition within such projects. At the same time, **adequate promotional measures would also have to be taken for development of technologies and a sustained growth of these sources.**
- "5.12.2 The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the SERCs

by **providing suitable measures for connectivity with grid and sale of electricity to any person** and also by **specifying**, for purchase of electricity from such sources, a **percentage of the total consumption** of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made **applicable for the tariffs to be determined by the SERCs at the earliest**. Progressively the **share of electricity from non-conventional sources** would **need to be increased** as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the **Commission may determine an appropriate differential in prices to promote these technologies**.

- 5.12.3 Industries in which both process heat and electricity are needed are well suited for cogeneration of electricity. A significant potential for cogeneration exists in the country, particularly in the sugar industry. **SERCs may promote arrangements between the co-generator and the concerned distribution licensee for purchase of surplus power from such plants**. Cogeneration system also needs to be encouraged in the overall interest of energy efficiency and also grid stability." **(emphasis added)**

#### 4.1.3 Tariff Policy

National Electricity Policy was notified by Central Government during January 2006 as per provisions of Section 3 of EA 2003. Tariff Policy has further elaborated the role of regulatory commissions, mechanism for promoting harnessing of renewable energy and timeframe for implementation etc. The Clause 4 of the TP addresses various aspects associated with promotion and harnessing of renewable energy sources. The salient features of the said provisions of TP are as under:

- Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall **fix a minimum percentage** for purchase of energy from such sources taking **into account availability of such resources in the region and its impact on retail tariffs**. Such percentage for purchase of energy should be made applicable for the tariffs to be determined by the **SERCs latest by April 1, 2006**. It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. Therefore, **procurement by distribution companies shall be done at preferential tariffs determined by the Appropriate Commission**.



- Such procurement by Distribution Licensees for future requirements shall be done, **as far as possible**, through **competitive bidding process** under **Section 63** of the Act **within suppliers offering energy from same type of non-conventional sources**. In the long-term, these technologies would need to compete with other sources in terms of full costs.
- The **Central Commission** should lay down guidelines **within three months** for **pricing non-firm power**, especially from non-conventional sources, to be followed in cases where such procurement is not through competitive bidding."

#### 4.2 RPO Orders of various States

Under Section 86(1)(e) of the EA2003, the SERCs are empowered to specify the percentage of electricity to be procured by the obligated entities from the renewable sources of energy. Most SERCs have put significant emphasis on this provision and have issued Orders/Regulations specifying such percentages. This percentage is referred to as 'Renewable Portfolio Standard' (RPS) or Renewable Purchase Specification (RPS) or 'Renewable Purchase Obligation' (RPO). The Working Group on Renewable Energy of Forum of Regulators has recommended usage of 'Renewable Purchase Obligation' (RPO) for this percentage under Section 86(1)(e). Therefore, we have used term RPO throughout this Report.

Accordingly many SERCs have specified the percentage or RPO for area under their jurisdiction by issuing RPO Orders or Regulations. The table 4.1 below presents the percentage obligations levied by various SERCs in their respective jurisdictions. It can be easily noted from the table that obligation under Section 86(1)(E) varies significantly from the State to State.

Table 4.1: Target for RPS obligation <sup>8</sup>

| States         | Date of the RPS order                              |                         | Minimum percentage of renewable power in following years |         |         |         |         |         |         |
|----------------|--|-------------------------|--|---------|---------|---------|---------|---------|---------|
|                |  |                         | 2005-06  | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 |
| Andhra Pradesh | September 27, 2005<br>extended up to July 31, 2008 |                         | 5%   | 5%      | 5%      | 5%      | -       | -       | -       |
| Chhattisgarh   | Regulation dt. July14, 2008                        | Biomass                 |  |         |         | 5%      | 5%      | 5%      |         |
|                |  | Small hydel             | -  | -       | -       | 3%      | 3%      | 3%      | -       |
|                |  | Others                  |  |         |         | 2%      | 2%      | 2%      |         |
| Delhi          | Feb 23, 2008                                       | NDPL                    | -  | -       | 1%      | 1%      | 1%      | 1%      | -       |
|                | 23-Feb-08  | BYPL                    | -  | -       | 1%      | 1%      | 1%      | 1%      | -       |
|                | Feb 23, 2008                                       | BRPL                    | -  | -       | 1%      | 1%      | 1%      | 1%      | -       |
|                | 7-Mar-08   | NDMC                    | -  | -       | 1%      | 1%      | 1%      | 1%      | -       |
| Gujarat        | Notification Oct 29, 2005                          |                         | -  | 1%      | 1%      | 2%      | -       | -       | -       |
| Haryana        | January 31, 2007                                   |                         | -  | 2%      | 2%      | 3%      | 10%     | 10%     | 10%     |
| Karnataka      | January 23, 2008(Amendment of regulation 2004)     | Wind                    | -  | -       | 2%      | 2%      | 2%      | -       | -       |
|                |  | SHP                     | -  | -       | 2%      | 2%      | 2%      | -       | -       |
|                |  | Others                  | -  | -       | 1%      | 1%      | 1%      | -       | -       |
| Kerala         | Regulation June 24, 2006                           | SHP-2%                  |  |         |         |         |         |         |         |
|                |  | Wind-2%                 | -  | 5%      | 5%      | 5%      | -       | -       | -       |
|                |  | Others-1%               |  |         |         |         |         |         |         |
| Madhya Pradesh | Regulation June 2008                               | Wind                    | -  | -       | -       | 5%      | 6%      | 6%      | 6%      |
|                |  | Biomass                 | -  | -       | -       | 2%      | 2%      | 2%      | 2%      |
|                |  | Cogeneration and others | -  | -       | -       | 3%      | 2%      | 2%      | 2%      |
| Maharashtra    | August 16, 2006                                    |                         | -  | 3%      | 4%      | 5%      | 6%      | -       | -       |
| Punjab         | December 13, 2007                                  |                         | -  | -       | 1%      | 1%      | 2%      | 3%      | 4%      |
| Rajasthan      | Proposed Order- March 31, 2006                     | Wind                    | -  | 2%      | 4%      | 5%      | 6%      | 6.75%   | 7.5%    |
|                | Final RPS order Sept. 29, 2006,                    | Biomass                 | -  | 0.5%    | 0.88%   | 1.25%   | 1.45%   | 1.75%   | 2%      |
|                | RPS order for OA and CPP - March 7, 2007           | CPP and OA              | -  | -       | 4.88%   | 6.25%   | 7.45%   | 8.5%    | 9.5%    |
| Tamil Nadu     | May 15, 2006                                       |                         | -  | 10%     | 10%     | 10%     | -       | -       | -       |
| Uttarakhand    | UERC (Tariff for Electricity from RE)              |                         | -  | -       | 5%      | 5%      | 8%      | 9%      | 10%     |
| West Bengal    | Notification dated March 25, 2008                  | WBSEB                   | -  | 1.9%    | 3.8%    | 4.8%    | 6.8%    | 8.3%    | 10%     |
|                |  | CESC                    | -  | 1.02%   | 2.03%   | 4%      | 6%      | 8%      | 10%     |
|                |  | DPL                     | -  | 0.72%   | 1.4%    | 2.5%    | 4%      | 7%      | 10%     |
|                |  | DPSC                    | -  | 0.43%   | 0.95%   | 2%      | 4%      | 7%      | 10%     |

#### 4.2.1 Other critical features of RPO

In case of RPO obligations, percentage is not the only thing which varies significantly. Other parameters such as applicability to OA/ Captive consumers, period of obligation and compliance procedures are few other areas where significant difference of opinion among various SERCs exists. Following table presents views of the different SERCs on few such other critical issues.

<sup>8</sup> RPS Orders and Regulations of various States for respective years

Table 4.2: RPO Implementation in India <sup>9</sup>

| State            | RPO Declared Till | RE Technology Specific Targets | Applicability to entities other than the Distribution Licensees | Enforcing /Penalty Mechanism | Recognition of Inter-State RE Purchase |
|------------------|-------------------|--------------------------------|---|------------------------------|--|
| Andhra Pradesh   | FY 2009           | Yes (only for Wind)            | OA & Captive Consumers  | Yes                          | No                                     |
| Chhattisgarh     | FY 2011           | Yes (Biomass, Small Hydro)     | -   | No                           | No                                     |
| Delhi            | FY 2011           | No                             | -   | No                           | No                                     |
| Gujarat          | FY 2010           | No                             | -   | No                           | No                                     |
| Haryana          | FY 2012           | No                             | -   | No                           | No                                     |
| Himachal Pradesh | FY 2010           | No                             | -   | No                           | No                                     |
| Karnataka        | FY 2010           | Yes (Wind, SHP)                | -   | No                           | No                                     |
| Kerala           | FY 2009           | Yes (Wind, SHP)                | -   | No                           | No                                     |
| Madhya Pradesh   | FY 2012           | No                             | -   | No                           | No                                     |
| Maharashtra      | FY 2010           | No                             | OA & Captive Consumers  | Yes (Rs. 6/unit)             | No                                     |
| Punjab           | FY 2012           | No                             | -   | No                           | No                                     |
| Rajasthan        | FY 2012           | Yes (wind, biomass)            | OA & Captive Consumers  | No                           | No                                     |
| Tamil Nadu       | FY 2009           | No                             | -   | No                           | No                                     |
| Uttar Pradesh    | FY 2011           | No                             | -   | No                           | No                                     |
| Uttarakhand      | FY 2012           | No                             | -   | No                           | No                                     |
| West Bengal      | FY 2011           | No                             | -   | No                           | No                                     |

### 4.3 RE Tariff

The existing regulatory framework requires the Appropriate Commission to determine the Preferential Tariffs for procurement of RE power by the distribution licensees under RPO regime. It is envisaged that the Commission will determine tariff separately for

<sup>9</sup> Latest RPS Orders and Regulations by SERCs

each type of technology adopted for harnessing any of the renewable energy sources. For instance, it is expected that separate tariffs will be determined for solar thermal and solar PV applications. Following table (3.4) summarises the tariffs determined for various RE based generation sources across various States. The table also provides vital information about the average power purchase costs in these States.

**Table 4.3: Comparison of Tariff for Renewable based power with  
Average Power purchase of few identified States <sup>10</sup>**

| State          | Tariff (Rs./kWh) |             |         |         |            |                 | Avg. Power Purchase Cost (Rs./kWh) |
|----------------|------------------|-------------|---------|---------|------------|-----------------|------------------------------------|
|                | Wind             | Small Hydro | Biomass | Bagasse | Solar * PV | Solar * Thermal |                                    |
| Andhra Pradesh | 3.37             | 2.6         | 2.88    | 2.75    | 7          | 7               | 1.83                               |
| Gujarat        | 3.37             | -           | 3.1     | 3       |            |                 | 2.46                               |
| Karnataka      | 3.4              | 2.8         | 2.85    | 2.8     | 3.4+12     | 3.4+10          | 3.22                               |
| Kerala         | 3.14             | 2.44        | -       | 2.8     | 3.18+12    | -               | 1.74                               |
| Madhya Pradesh | 3.97             | -           | 3.4     | -       | -          | -               | 1.97                               |
| Maharashtra    | 3.5              | 3           | 3.04    | 3.05    | 3 +12      | 3 +10           | 2.58                               |
| Rajasthan      | 3.65             | -           | 4.48    | -       | 15.7       | -               | 2.61                               |
| Tamil Nadu     | 2.9              | -           | 3.15    | 3.15    | 3.15       | 3.15            | 1.78                               |
| West Bengal    |                  |             |         |         |            |                 |                                    |
| WBSEB          |                  |             |         |         |            |                 |                                    |
| CESC           | 4                | 4           | 4       | 2.6     | 11         | 11              | 2.04                               |
| Durgapur       |                  |             |         |         |            |                 |                                    |
| DPSC           |                  |             |         |         |            |                 |                                    |
| Haryana        | 4.08             | 3.67        | 4       | 3.74    | 15.96      | -               | 2.68                               |

It is apparent from the above table that in all the States the tariff applicable to any RE technology is higher than the average power purchase cost in that particular States. The high tariff of RE based power in comparison to the average power purchase cost has

<sup>10</sup> Latest Tariff orders for various States

\* Generation Based Incentive is shown wherever applicable

been one of the key barriers in large scale deployment of RE power. The distribution licensees have been reluctant to contract RE power beyond their RPO target.

#### 4.4 Drivers for REC Mechanism in India

In this section some of the significant limitations of RPO regulation have been highlighted.

##### 4.4.1 Absence of Legal and Regulatory Framework to Facilitate Purchase of RE from Outside the State

Existing RPO regulations recognize procurement of renewable energy generated in the State by Obligated Entities for fulfilment of RPO. Procurement of renewable energy generated outside the State has not been recognized by any SERC for the purpose of RPO compliance. Besides, renewable energy being site specific resource, guidelines under the Tariff Policy have specified that the SERC shall be guided by the factors such as availability of renewable energy resources within the region and its impact on retail tariff within State while stipulating the percentage for RPO. This has resulted in RPO regulations being viewed only from the State perspective and lack National perspective of harnessing available entire RE potential in the country.

##### 4.4.2 Percentage specification for only short term period

In many States, RPO percentage has been specified for limited period of 2 to 3 years, which does not provide long term perspective for harnessing of renewable energy within the State. Short term targets do not create long term market for technologies and products. Further, most States have specified targets close to their existing purchase levels, which does not kick-start or accelerate development of new RE projects. To provide certainty of market to RE Project developers and equipment manufacturers, it is necessary to demonstrate long term perspective with challenging targets.

##### 4.4.3 No RPO for Open access (OA) and Captive consumers

The Section 86(1)(e) of EA 2003 provides for specification of percentage applicable on the 'consumption' within area of distribution licensee and not to procurement of energy by the distribution licensee alone. Thus, it appears that the intention of the legislature is to apply such percentage on entire consumption in the area of distribution licensee irrespective of who is supplying such energy. However, currently, except few States



such as Maharashtra, Rajasthan, and Andhra Pradesh, all the other States do not impose RPO on OA/Captive consumers.

Besides, if RPS obligation is levied only on distribution licensees and if eligible open access consumers are exempted then, it will not be fair to non-eligible open access consumers of the distribution licensees as they will have to bear the complete cost of RE procurement. While it is clear that renewable energy based power generation needs to be promoted, it is equally important that the costs and benefits of such harnessing are equitably distributed amongst all concerned. Accordingly, it would only be appropriate that Open Access and Captive consumers are also subjected to RPO regime.

#### **4.4.4 Weaker Enforcement Methodology**

In order to ensure strict compliance with the RPO regulation, it was essential to put an efficient enforcement mechanism in place. However, only few States have included specific provisions for shortfall in RE procurement by Obligated Entities. It has been proved that enforcement mechanism acts as a deterrent and thereby incentivises the Obligated Entities to proactively seek contracts for procurement of renewable energy. However, due to weak enforcement methodology the objective of promotion of renewable energy through RPO regulation may not have been achieved.

## **4.5 Other Important Developments**

In the recent past, several developments have taken place, which emphasize the need of development of Renewable Energy Certificate Mechanism. These developments have been discussed in this section of the Report.

### **4.5.1 National Action Plan for Climate Change**

On June 30, 2008 Hon Prime Minister of India announced National Action Plan for Climate Change which delineated India's strategy to tackle menace of global warming without jeopardising prospects of economic growth. The Technical Document annexed to NAPCC includes following provisions for mainstreaming the RE based resources in India's power sector. In particular the document solicits use of REC mechanism. The provisions listed under section 4.2.2 of NAPCC on Grid Connected Systems, are as follows:





- A Dynamic Minimum Renewable Purchase Standard (DMRPS) may be set, with escalation each year till a pre-defined level is reached, at which time the requirements may be revisited. It is suggested that **starting 2009-10, the national renewables standard** (excluding hydropower with storage capacity in excess of daily peaking capacity, or based on agriculture based renewables sources that are used for human food) **may be set at 5% of total grids purchase, to increase by 1% each year for 10 years, SERCs may set higher percentages than this minimum at each point in time.**
- Central and State Governments may set up a verification mechanism to ensure that the renewables based power is actually procured as per the applicable standard (DMRPS or SERC specified). Appropriate authorities may also issue **certificates that procure renewable based power** in excess of the national standard. Such **certificates may be tradeable, to enable utilities falling short to meet their renewable standard obligations.** In the event of some utilities still falling short, **penalties** as may be allowed under the Electricity Act 2003 and rules there under may be considered.
- Procurement of renewables based power by the State Electricity Boards/other power utilities should, in so far as the applicable renewable standard (DMRPS or SERC specified) is concerned, be based on competitive bidding, without regard to scheduling, or the tariffs of conventional power (however determined).
- Renewables based power may, over and above the applicable renewables standards, be enabled to compete with conventional generation on equal basis (whether bid tariffs or cost-plus tariffs), without regard to scheduling (i.e. renewables based power supply above the renewables standard should be considered as displacing the marginal conventional peaking capacity). All else being equal, in such cases, the renewables based power should be preferred to the competing conventional power.

#### **4.5.2 FOR Working Group Recommendations**

Forum of Regulators (FOR) established under Section 166 of the Electricity Act is an association of Chairpersons of all electricity regulators. Chairperson of the Central Electricity Regulatory Commission is ex-officio Chairperson of the FOR. The primary responsibility of the FOR is to harmonize the regulatory policies in the country. The FOR

has established various Working Groups to look into different aspects of the electricity sector. FOR had set up Working Group on Renewable Energy which in its Report has stated following.

- Need for inter-State exchange of RE power
  - Inter-State exchange of RE power is desirable from National perspective and the same should be promoted.
  - Mechanism for appropriate treatment for inter-State RE exchange through Regional Energy Account needs to be developed.
  
- Feasibility of REC mechanism
  - RE Certificate as a tool for promotion of RE sources has been used in some countries. In India REC mechanism can be introduced within existing framework of EA 2003.
  - Co-operation amongst the States is essential and SERCs should recognize procurement of RE generated in other States for purpose of compliance, as RPS by regulated entity in their respective jurisdiction.

#### 4.5.3 Tariff Order of DERC

Delhi Electricity Regulatory Commission (DERC) in its Multi-year tariff orders for the control period of FY 2008-11 for its four distribution licensees, has acknowledged the need for procurement of RE from other States due to the scarcity of RE sources in Delhi. The DERC has put forward its views which are reproduced below.

*“The Commission is keen to promote the procurement from renewables. However, the scope for such procurement in Delhi is rather limited. It is therefore necessary for States like Delhi to look for procurement from renewables from other States. The matter was also discussed by the Commission in the State Advisory Committee meeting held on 21 January, 2008. The carbon credit trading is being done across continents. The system is very well established over a period of time. The Commission is of the view that it will be a good idea to create an environment in which the **renewable energy certificates can also be traded across various States in India**. The Commission earnestly requests the Govt. of India as well as the State Government for evolving an appropriate methodology for trading in renewables certificates so that States like Delhi, which do not have much scope in promoting renewables can at least follow the route of trading in renewables certificates. Any such trading in renewables certificates shall be evolved in such a manner which protects the interest of both the buyers and the sellers of such certificates”.*

## 4.6 Objectives for REC Mechanism in India

From the various issues discussed in this chapter, need of REC mechanism is evident. The significant objectives arising out of discussions in the chapter have been listed below:

### 4.6.1 Effective implementation of RPO Regulations

REC mechanism will enable obligated entities to procure renewable energy from RE generator outside the State. Thus for obligated entities, several avenues will be available for purchase of REC. This will enable obligated entities to fulfil their RPO obligation.

### 4.6.2 Increased Flexibility to Participants

REC mechanism will offer increased flexibility to Obligated Entities and the RE generators to sell and purchase renewable energy. The Obligated Entities can procure RECs from RE generator outside the State and RE generator participating in the REC mechanism can sell its RECs and electricity separately to two different entities.

### 4.6.3 Overcome geographical constraints

As seen in chapter 3, the RE sources are dispersed unevenly across the States in India. Through implementation of REC mechanism, the available potential can be harnessed to promote RE sources based power generation and to some extent meet the unfulfilled demand for electricity. Further, in current regulatory framework, renewable energy loses its green character as soon as it is traded across the State boundaries. The proposed mechanism should help overcome this barrier.

### 4.6.4 Reduce transaction costs for RE transactions

Currently inter-State RE transactions are subjected to the inter-State open access Regulations. RE transactions are subjected to OA charges as well as balancing market costs in a manner similar to conventional generation. Further, RE generators are required to give schedules just like any other generator. As a result, the costs associated with open access transaction (whether intra-state or inter-state) involving RE are significantly higher than that for conventional generator of the same size.

If implemented, REC mechanism will enable RE generators to sell their electricity to any consumer of their choice and sale RECs generated from quantum of such electricity to any Obligated Entity. Hence, other than procurement of RECs, no other transaction is necessary for obligated entities to meet their RPS target. Thus, for Obligated Entities the cost of fulfilling RPO obligation is expected to go down substantially.

#### **4.6.5 Enforcement or penalty mechanism**

The existing RPO Regulations/ Orders do not have strong enforcement provisions in case the obligated entities fail to meet their RPO. This has led to lackadaisical attitude in some of the Obligated Entities towards their RPS obligation. The potential dangers of such scenario are obviously very high. While REC mechanism on its own can not improve compliance, it is necessary to develop and implement suitable enforcement mechanism while developing REC mechanism.

#### **4.6.6 Create competition between different RE technologies**

There is a need for promoting the RE technologies which are in nascent stage of their development over those which are already into the mature commercial market. The distinction between the two is important. The REC mechanism can enable such distinction between different RE technologies at different stages of development. The specific RE technology can be provided with more promotional incentives than the other mature RE technologies. Such schemes are being designed in many countries. This is proposed to be done by issuing more than one REC for 1MWh of RE generation. Thus with selective support to some RE technologies competitive market for RE technologies can be brought into place.

#### **4.6.7 Development of all encompassing incentive mechanism**

International experience in implementation of REC mechanisms have been discussed in next chapter. If this experience is considered, it can be easily observed that REC mechanism is primarily used as an incentive mechanism for improving the financial viability of the renewable energy projects.

#### **4.6.8 Reduce risks for local distribution company**

Currently under the RPO regulation the Obligated Entity has to locate the RE generator and physically procure the power from to fulfil its RPO obligation. This increases the cost for local distribution company. Further, since most of RE generators are not-schedulable and/or dispatchable, procurement of power from such sources subject local distribution company to balancing market costs. The REC mechanism should reduce the risks being borne by the local distribution company.



#### 4.7 Conclusion

Considering the unique barriers suffered by the renewable energy sector in India, it is felt that following five objectives should take precedence over others.

1. Effective implementation of RPO mechanism
2. Increased flexibility for participants
3. Overcome geographical constraints
4. Reduced transaction costs for RE transactions
5. Enforcement of penalty mechanism

## 5. Key Legal Issues in the Development of REC Framework

Apart from the key Objectives of the REC mechanism discussed above there are certain legal issues which should be dealt in order to achieve successful implementation of REC Framework in India. The key legal issues in the Development of REC Framework in India are,

### 5.1.1 Recognition of Inter-State RE Transaction for RPO compliance

In pursuance of section 86(1) (e) of EA 2003 and as mentioned in section (4.6) of NAPCC whether SERC(s) under its RPO regulation or RPO order, can recognise procurement of electricity generated from Renewable Energy sources outside its State, by person/distribution company within its State to fulfil their renewable purchase obligations, particularly in view that SERCs jurisdiction is to promote renewable energy within its State?

The freedom of a person / distribution licensee to procure electricity from any place / location is one of the core objects of the EA 2003. The concepts of electricity trading and open access are the tools for achieving such freedom of procurement of electricity.

Section 86 (1) (e) of EA, 03, relates to the functions of the SERC, provides as follows:

*"promote co-generation and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;"*

Section 86 (1) (e) do not express any restriction on the State Commission's ability to recognize (or take into account) procurement of electricity generated from renewable energy sources outside the State by a person / distribution licensee within the State, so as to fulfill its statutory renewable purchase obligations.

Next, it needs to be checked if there is any implied restriction – so as to hold that the main object of Section 86 (1) (e) is to promote generation from renewable sources in the State. Therefore, to allow procurement within the distribution area from other States would defeat the very purpose of the said Section. To address this concern, it is necessary to refer to the context in which Section 86 (1) (e) is placed. Section 7 of the EA 2003, states that generation of electricity whether from renewable sources or otherwise, is

de-licensed. Further, the SERC have not been vested with regulatory superintendence over generation of electricity, save and except to a limited extent provided in Section 62.

A careful / close scrutiny of Section 86(1) (e) of EA 2003 will reveal that the focus is clearly on consumption of renewable energy within the area of the distribution licensee. In order to ensure such consumption, the SERC has been vested with the power to:

- (a) provide suitable measures for connectivity with the Grid, and
- (b) specify the minimum purchase obligation

This power will be exercised through the licensees, consistent with the other functions of the SERC. It is necessary to create a distinction between the function of the SERC in section 61 (h) and Section 86 (1) (e) of the Act. In Section 61(h) the mandate is to specify terms and condition of tariff. Under this provision the SERC has the ability to provide promotional tariff for co-generation and generation of electricity from renewable sources. Section 61 (h) has to be read with Section 62, under which section the SERC has the power to determine tariff of a generating plant for supply to a distribution licensee.

The mandate under Section 61 (h) is different from that in Section 86(1) (e). In Section 86 (1) (e), as stated earlier, the focus is on consumption within the distribution area. To promote consumption, the SERC has been vested with two distinct powers. However, Section 61 (h) is towards providing promotional-tariff, which will incentivize creation of generating assets in the State. **If the distinction is appreciated, there will be no difficulty in holding that Section 86(1) (e) operates in a different sphere and is not related to the location of the generator.**

#### **5.1.2 Jurisdiction of Appropriate Commission for Pricing of REC and Electricity component**

In view of inter-State nature of REC transactions, the issues to be addressed in the context of regulatory jurisdiction for pricing of REC and electricity component are as under:

- (a) If SERC(s) recognise the RE generation outside their State through RPO regulation or RPO order so as to allow their utilities to meet their RPO, who should regulate the Tariff rate for such procurement ?





- (b) Will it be concerned the SERC to determine Generation Tariff where RE Generator is located under Section 61(h) or will it be SERC to regulate Rate of Procurement where distribution licensee is situated under Section 86(1)(b) or will it be CERC being inter-State transaction as per Section 79(1)(b)?
- (c) Which Appropriate Commission (SERC or CERC) would have governing jurisdiction to regulate such inter-State Power Purchase Agreement/Arrangement?
- (d) Will the answers to queries (b) and (c) change, if concerned RE partly sells its RE generation within State and partly sells to entities outside the State?

The EA 2003 does not create any difference in the regime between conventional energy and renewable energy as far as determination of generation tariff is concerned. For procurement of electricity by a distribution licensee, whether from conventional sources or otherwise, the Appropriate Commission will have the ability to determine tariff. In this context, reference can be made to section 62(1) (a) and (b), 79(1) (b) and Section 86 (1) (a) and (b) of EA 03.

**Section 62** (1) *The Appropriate Commission shall determine tariff in accordance with the provisions of this Act for -*

(b) supply of electricity by a generating company to a distribution licensee:

*Provided that the Appropriate Commission may, in case of shortage of supply of electricity, fix the minimum and maximum ceiling of tariff for sale or purchase of electricity in pursuance of an agreement, entered into between a generating company and a licensee or between licensees, for a period not exceeding one year to ensure reasonable prices of electricity;*  
.....”

**Section 79** (1) *The Central Commission shall discharge the following functions -*

.....

(c) *to regulate the tariff of generating companies other than those owned or controlled by the Central Government specified in clause (a), if such generating companies enter into or otherwise have a composite scheme for generation and sale of electricity in more than one State.*

**Section 86** (1) *The State Commission shall discharge the following functions namely:-*

(a) *determine the tariff for generation, supply, transmission and wheeling of electricity, wholesale, bulk or retail, as the case may be within the State:*

.....





*(b) regulate electricity purchase and procurement process of distribution licensee including the price at which electricity will be procured from the generating companies or licensee or from other sources through agreements for purchase of power for distribution and supply within the State.*

The aforesaid provisions have to be harmoniously construed, so as to ensure that they do not negate. From the aforesaid it is quite clear that only tariff for electricity supplied by a generating company to a distribution licensee is required to be determined by an Appropriate Commission. If the electricity is sold by a generating company to a trading licensee or a consumer, there is no statutory requirement for determining generation tariff. The language of Section 62(1) (a) is clear and unambiguous.

Section 79 (1) (b) comes into operation when a generating company enters into or has a composite scheme for generation and sale of electricity to distribution licensees in more than one State. Hence in order to trigger Section 79 (1) (b) two conditions i.e. generation and sale of electricity in more than one State have to be fulfilled.

Therefore, while approving the power procurement of the distribution licensee, the State Commission will approve / disapprove the power procurement costs of the licensee for procurement of power from a generator, which includes an RE Generator. This conclusion is on the basis of the clear language of Section 61(a) and Section 86(1) (b).

As regards the tariff provided under Section 61(h), this is only relevant when the RE generator is selling the power within the State. If he does so he gets a preapproved rate from the distribution licensee, which will be automatically approved under Section 86(1) (b). It is sufficient to say that Section 79(1)(b) is meant to operate in a different sphere when there is a composite scheme for generation and sale of electricity in more than one State.

Unless the generating company fulfils the above conditions, and also sell electricity in more than one State, 79(1)(b) will not operate.

Hence it is possible that if the preconditions of Section 79(1) (b) are met the CERC will have jurisdiction to "regulate" the tariff of the generating companies. However, the exercise of this power will not prevent the State Commission in exercising its power qua the distribution licensee's procurement process. A harmonious constructions of the two

provisions would be that the CERC's jurisdiction to regulate tariff under 79(1) (b) will be in all cases except those under Section 86(1) (b). One can conclude that the CERC has the ability to create a framework to regulate tariff of generating companies having a composite scheme for generation and sale of electricity in more than one State.

At present, the CERC has not taken any steps to define what a composite scheme. It may be necessary to do so in future. As regards inter-state Power Purchase Agreement, those are executed by a distribution licensee and are regulated by the State Commission in which such licensee is located. The CERC does not have any role to play in this regard.

If RE generator is established on the basis of a composite scheme for generation and sale of electricity in more than one State, it is possible that the CERC will have the ability to regulate the tariff of such a generating company. However, this cannot negate the power of the State Commissions to regulate the procurement process of the distribution licensees. The CERC's tariff will only act as guidance. In such circumstances, however, the tariff of the generator which is regulated by CERC will find greater acceptability with a trading licensee or a consumer.

### **5.1.3 Enforcement Provisions**

The mandatory RE procurement target under RPO regulations is unlikely to yield desired results unless adequate enforcement mechanism is introduced. In fact, lack of adequate enforcement mechanism under existing RPO regulations in many States have been one of the reasons for non-compliance or lacklustre performance by various obligated entities in meeting their RPO obligations. The success of REC mechanism is critically dependent on introduction of appropriate mechanism for enforcement. Some States such as Maharashtra, Rajasthan etc. have introduced compensation in the form of per unit enforcement charge or surcharge for shortfall in meeting RE procurement obligations over and above penal provisions as provided under Section 142 for non-compliance.

Thus, there is increasing realization that appropriate penalties for non-fulfillment of RPOs are required to be incorporated by SERCs in their regulations. It is preferred that FOR evolves harmonized approach for this purpose. It was felt that the amount of this penalty has to be higher than what is provided under section 142 of the Electricity Act. However, FOR Task Force opined that the proposition of specifying penalties higher than those provided under section 142 of the Act should be examined from legal angle.



Accordingly, legal scrutiny and findings in the matter are summarised below:

Section 86 of the Electricity Act, 2003 provides the following functions of State Commission:

*"86. (1) The State Commission shall discharge the following functions, namely: -*

*.....*

*(e) promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licence;*

*.....*

*(k) discharge such other functions as may be assigned to it under this Act."*

The State Commission clearly has a positive mandate under the Act to promote cogeneration and generation from renewable sources. This power is strengthened with the ability conferred on the Commission to specify "for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licence".

The clear mandate of the statute cannot be implemented unless there is an enforcement charge. In this context, the Hon'ble Supreme Court of India, has passed various judgments where the power to "enforce" has been held to fall with the "regulators" jurisdiction.

Relevant judgments of the Supreme Court of India are as under;

**(i) The Hon'ble Supreme Court of India has held in *U.P. Power Corporation Ltd. vs. National Thermal Power Corporation Ltd. and Ors.* JT 2009 (3) SC 462 that:**

*"5. A regulatory Commission not only makes Regulations but in view of its extensive powers but also in-charge of implementation thereof. It furthermore in the event of any dispute or difference arising between several players involved in the framing of tariff for the consumers of electrical energy has also an adjudicatory role to play.*

*...*

*29. The Central Commission in terms of the 1998 Act as also the Regulations framed thereunder exercise diverse powers. It exercises legislative power, power of enforcement of the Regulations as*

also the adjudicatory power. Each of its functions although are separate and distinct but may be overlapping. The power of the Central Commission is extensive.

...

35. The Central Commission, as indicated hereinbefore, has a plenary power. Its inherent jurisdiction is saved. Having regard to the diverse nature of jurisdiction, it may for one purpose entertain an application so as to correct its own mistake but in relation to another function its jurisdiction may be limited. The provisions of the 1998 Act do not put any restriction on the Central Commission in the matter of exercise of such a jurisdiction. It is empowered to lay down its own procedure."

**(ii) In relation to the validity and efficacy of the UI mechanism, the Supreme Court held in *Central Power Distribution Co. and Ors. v. Central Electricity Regulatory Commission AIR 2007 SC 2912*, that:**

"22.3 As already noticed, the Central Commission has the power and function to evolve commercial mechanism such as imposition of UI charges to regulate and discipline. It is well settled that a power to regulate includes within it the power to enforce."

The State Commissions have been empowered under the Electricity Act, 2003 to regulate electricity purchase and procurement process of distribution licensees as well as to promote cogeneration and generation of electricity from renewable sources of energy. Thus, levy of enforcement charges through a "commercial mechanism" is held to be well within regulatory powers of the State Commission and is quintessential for ensuring implementation of its orders. Once Supreme Court of India has upheld the UI mechanism, which promote grid discipline through a commercial mechanism, there is a strong case for providing a commercial mechanism to meet the objects provided in Section 86 (1) (e) of the Act. In any event, the jurisdictional issue stands settled and State Commission will certainly have the ability to design a commercial mechanism in the form of enforcement charge.

**(iii) In *K. Ramanathan v. State of Tamil Nadu AIR 1985 SC 660*, the Hon'ble Supreme Court held:**

*"18. The word "regulation" cannot have any rigid or inflexible meaning as to exclude "prohibition". The word "regulate" is difficult to define as having any precise meaning. It is a word of broad import, having a broad meaning, and is very comprehensive in scope.*

There is a diversity of opinion as to its meaning and its application to a particular state of facts, some courts giving to the term a somewhat restricted, and others giving to it a liberal, construction. The different shades of meaning are brought out in *Corpus Juris Secundum*, Vol. 76 at p. 611:

'Regulate' is variously defined as meaning to adjust; to adjust, order, or govern by rule, method, or established mode; to adjust or control by rule, method, or established mode, or governing principles or laws; to govern; to govern by rule; to govern by, or subject to, certain rules or restrictions; to govern or direct according to rule; to control, govern, or direct by rule or regulations. 'Regulate' is also defined as meaning to direct; to direct by rule or restriction; to direct or manage according to certain standards, laws, or rules; to rule; to conduct; to fix or establish; to restrain; to restrict.

See also: Webster's Third New International Dictionary, Vol. II, p. 1913 and Shorter Oxford Dictionary, Vol. II, 3rd Edn., p. 1784."

- (iv) **In State of U.P. v. Maharaja Dharmander Prasad Singh AIR1989SC997 the Hon'ble Supreme Court held that the power to regulate includes all powers incidental and supplemental to it. The relevant paragraph is reproduced as under:**

"52. ...In this case the grant of permission is part of or incidental to the statutory power to regulate orderly development of the "Development Area" under the Act under Regulatory Laws. The power to regulate with the obligations and functions that go with and are incidental to it, are not spent or exhausted with the grant of permission. The power of regulation which stretches beyond and the mere grant of permission, takes within its sweep the power, in appropriate cases, to revoke or cancel the permission as incidental or supplemental to the power to grant. Otherwise the plenitude of the power to regulate would be whittled down or even frustrated."

- (v) **In Hotel & Restaurant Assn. and Anr. v. Star India (P) Ltd. and Ors. AIR2007SC1168, in regard to the role of TRAI as a regulator, the Hon'ble Supreme Court said:**

*"55. TRAI exercises a broad jurisdiction. Its jurisdiction is not only to fix tariff but also laying down terms and conditions for providing services. Prima facie, it can fix norms and the mode and manner in which a consumer would get the services.*

*56. The role of a regulator may be varied. A regulation may provide for cost, supply of service on non-discriminatory basis, the mode and manner of supply making provisions for fair competition providing for a level playing field, protection of consumers' interest, prevention of monopoly. The services to be provided for through the cable operators are also recognised. While making the regulations, several factors are, thus required to be taken into account. The interest of one of the players in the field would not be taken into consideration throwing the interest of others to the wind."*

**(vi) The Hon'ble Supreme Court of India in Cellular Operators Association of India & Ors. Vs. Union of India MANU/SC/1368/2002 has held as follows:**

*"33. The regulatory bodies exercise wide jurisdiction. They lay down the law. They may prosecute. They may punish. Intrinsically, they act like an internal audit. They may fix the price, they may fix the area of operation and so on and so forth. While doing so, they may, as in the present case, interfere with the existing rights of the licensees."*

From the aforesaid judgments, one can conclude that the power to levy enforcement charge is available with a regulator. However, the regulator has to act only in terms of the statute under which he is created. In this context, the power to promote renewable energy by fixing minimum purchase obligation is only available to the State Commission under Section 86 (1) (e) of the Act. Hence, one can argue that the only limitation to levy of enforcement charge is that the same can be levied and / or recognised by the State Commissions. The Central Commission does not have the powers equivalent to the ones provided under Section 86 (1) (e).

## 6. International Experience with Certificate Trading Schemes

As a part of the Assignment, ABPS Infra carried out the study of the 'Certificate Trading Schemes' in operation in different parts of the world. This chapter summarises the key learning from these Certificate Trading Schemes. In particular, the study was carried out of schemes in operation in United Kingdom, Australia, and European Union. The Certificate Trading Schemes discussed in this Chapter are well recognized for their success with their respective primary objectives.

In this chapter, the focus of study is to understand the operating framework of the mechanism and its features, legal and regulatory framework, certificate design, life of the scheme, scope of technologies and the roles and responsibilities of various stakeholders.

### 6.1 Framework of REC Mechanism in International Case studies

Internationally, the RECs are issued to RE generators, typically for every MWh of electricity fed into the grid by an eligible RE generator or equivalent amount of electricity displaced using a RE source. Revenue from sale of REC is treated as an additional source of revenue for an eligible RE generator. While all schemes include all grid-interactive RE technologies, some schemes also include off-grid RE technologies.

The involvement of the Regulatory Institution varies significantly from scheme to scheme. While in UK, Office of Gas & Electricity Markets (OFGEM) administers the ROCS scheme; in Australia, separate institution called Office of Renewable Energy Regulation (ORER) has been created. The typical life cycle of REC can be described through following three phases.

#### 1. Issue of REC:

For every MWh of electricity generated by an eligible renewable source a certificate (physical or electronic) is issued to the generator by the registry appointed under the scheme which also tracks movement/ transfer of the certificate.

#### 2. Ownership (Transfer/Trade):

RECs so issued are owned by a single party at any point during its life. The RECs may be owned by the generator, or a trader, or an obligated entity or any other kind of buyer permitted under the scheme.





### 3. Redemption:

Upon receipt of the request from the certificate owner (typically an obligated entity) to redeem its REC; the registry transfers the certificate to a redemption account and then informs the owner by means of a written declaration that its certificate has been redeemed. Such redeemed certificate can no longer be transferred or traded. This record is further used as a proof by the obligated entity to demonstrate compliance of RPO.

Typically the certificate issued to the RE generator contains information about its unique identification number, generator, nature of source i.e. wind, solar, etc, period of generation date, and validity period.

In this chapter two different REC mechanisms have been discussed. Salient features such as declared life of certificate scheme, key stakeholders and their role, supporting legal framework, success of the mechanism, etc for each scheme have been provided separately in the following sections.

## 6.2 ROC mechanism in United Kingdom

The tradable RE certificate in United Kingdom (UK) is called as Renewable Obligation Certificate (ROC). The 'Renewables Obligation' (RO) in UK, the 'Renewables Obligation Scotland' and the 'Northern Ireland Renewables Obligation' are designed to incentivise renewable generation into the electricity generation market. These schemes were introduced by the Department of Trade and Industry, the Scottish Executive and the Department of Enterprise, Trade and Investment respectively and are administered by the Gas and Electricity Markets Authority of Great Britain.

'Buy out' mechanism is an unique feature of the UK - ROCS. Under this mechanism, liable entities which are not able to purchase ROCs pay 'buy out' price to the administrator of the scheme for shortfall in ROCS. The money thus received in 'buy out fund' is redistributed to the liable entities to the extent they surrender ROCS to meet their obligation. This mechanism assists in improving the viability of the scheme.

#### A) Key Features:

- Implemented in UK in April, 2002
- Prior declaration of sunset date of ROC Scheme (March 2037)
- Increased proportion of renewable electricity over a period
- Liable entities can fulfil RO by:





- Acquiring ROCs
- Paying a buy-out price
- A combination of ROCs and paying a buy-out price.
- Buy-out and penalty fund is paid back to liable parties on a pro-rata basis of their surrendered ROCs.

B) Institutional Stakeholders:

The Gas and Electricity Market Authority, the regulator in UK is responsible for administering the ROC mechanism. The Office of Gas and Electricity Markets maintains ROC Registry.

C) Supporting Legal Framework:

- In UK, Renewable Obligation (RO) was introduced through Renewables Obligation Order (ROO) in April 2002 and was enforced under the terms of Section 32 of the Electricity Act, 1989.
- RO has been made the main support scheme for renewable electricity in the UK.
- Through ROO 2002, the targets for RO were defined for period upto March 31, 2011
- However, during the review of RO in 2009 target for FY 2020 was revised to 15 % and the ROC mechanism was extended to year 2037 from earlier 2027.

D) Latest Developments on UK ROCS

- By way of Renewable Obligations Order 2009 (ROO 2009), UK has implemented the proposal of Energy Banding under which less mature RE technologies, as shown in table (5.1) will be promoted over other mature renewable technologies.
- Preferential treatment is given to Wave/tidal, Solar PV, advanced gasification/ pyrolysis/digestion
- No preferential treatment for Hydro (>50kW) and wind power being fairly mature RE technologies
- Under Energy Banding proposal, the less mature technologies will be offered more ROCs for each MWh of generation as specified in table below.

Table (5.1): Energy Banding Approved in UK <sup>11</sup>

| RE Type                    | ROC/MWhe |
|----------------------------|----------|
| Hydro                      | 1        |
| Wind                       | 1        |
| Solar PV                   | 2        |
| Wave, Tidal, Geothermal    | 2        |
| Dedicated Biomass with CHP | 2        |
| Standard Gasification      | 1        |

### 6.3 REC Mechanism in Australia

The Government of Australia enacted The Renewable Energy (Electricity) Act 2000 for the establishment and administration of a scheme to encourage additional electricity generation from renewable energy sources. The objectives of this Act are:

- (a) to encourage the additional generation of electricity from renewable sources;
- (b) to reduce emissions of greenhouse gases; and
- (c) to ensure that renewable energy sources are ecologically sustainable.

This is done through the issuing of certificates for the generation of electricity using eligible renewable energy sources and requiring certain purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire during a year. Where a liable entity does not have enough certificates to surrender, the liable entity will have to pay renewable energy shortfall charge.

#### Key Features:

- Implemented in the year 2001
- Prior declaration of sunset date of REC Scheme (March 2020)
- Liable entities also include large buyers of electricity
- The Act sets renewable energy to be procured in absolute terms i.e. GWh
- Quantum of RE to be procured by the liable entities in percentage terms is set annually as a percentage of the sum of the relevant acquisitions of electricity.

<sup>11</sup> UK Renewables Obligation Order 2009



- Liable entities are required to discharge their liability by surrendering RECs to the Regulator or pay a shortfall charge, which is significantly higher than the average price of REC.
- In addition to the large RE generators, small generators with following capacity are also eligible for creation of REC
  - Hydro with installed capacity less than 6.4 kW & 25 RECs annually
  - Wind: with installed capacity less than 10 kW & 25 RECs annually
  - PV: with installed capacity less than 100kW & 250 RECs annually
- Solar water heating (using heaters complying with specified standard) is also eligible to create RECs.

Institutional Stakeholders:

Office of the Renewable Energy Regulator (ORER) oversees the processes of registration and issue, validation and surrender of RECs. However it does not control or monitor the price of RECs.

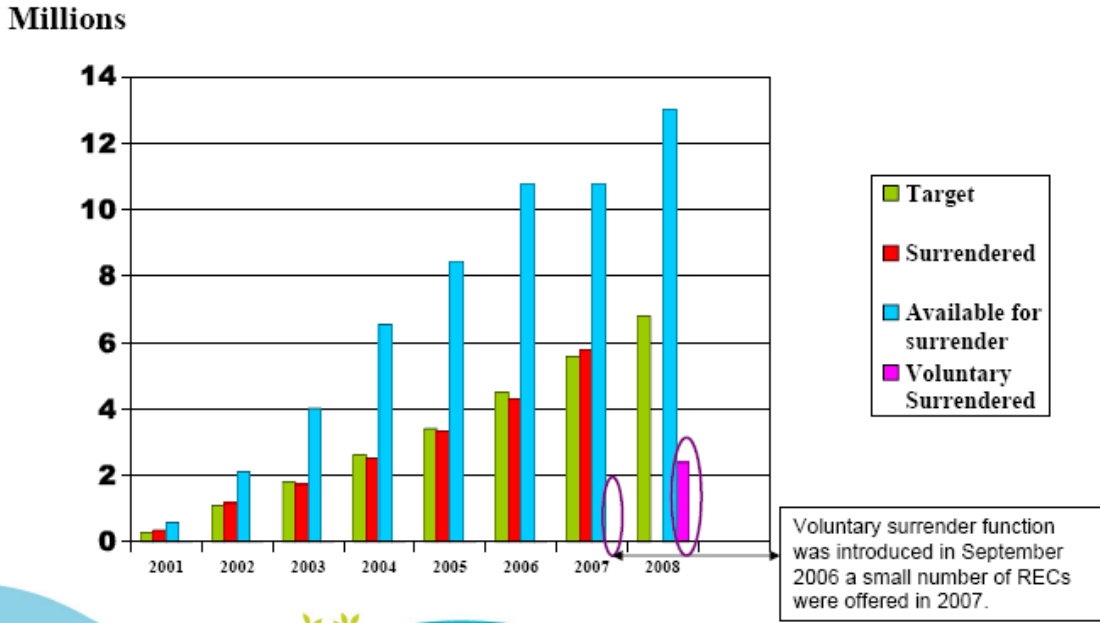
Supporting Legal Framework:

The necessary legal framework was established by creating a new act dedicated for RE development. The Renewable Energy (Electricity) Act 2000 is supported with The Renewable Energy (Electricity) (Charge) Act 2000. The act has been amended on need basis, so far 4 times, twice in year 2006 and 2008.

Success of REC Mechanism

Figure 5.3 shows that although the RPS target was increased year after year the REC mechanism has been successful enough to attract the investments for capacity addition of RE based power projects, which is apparent from trend of the number of RECs available for redemption.

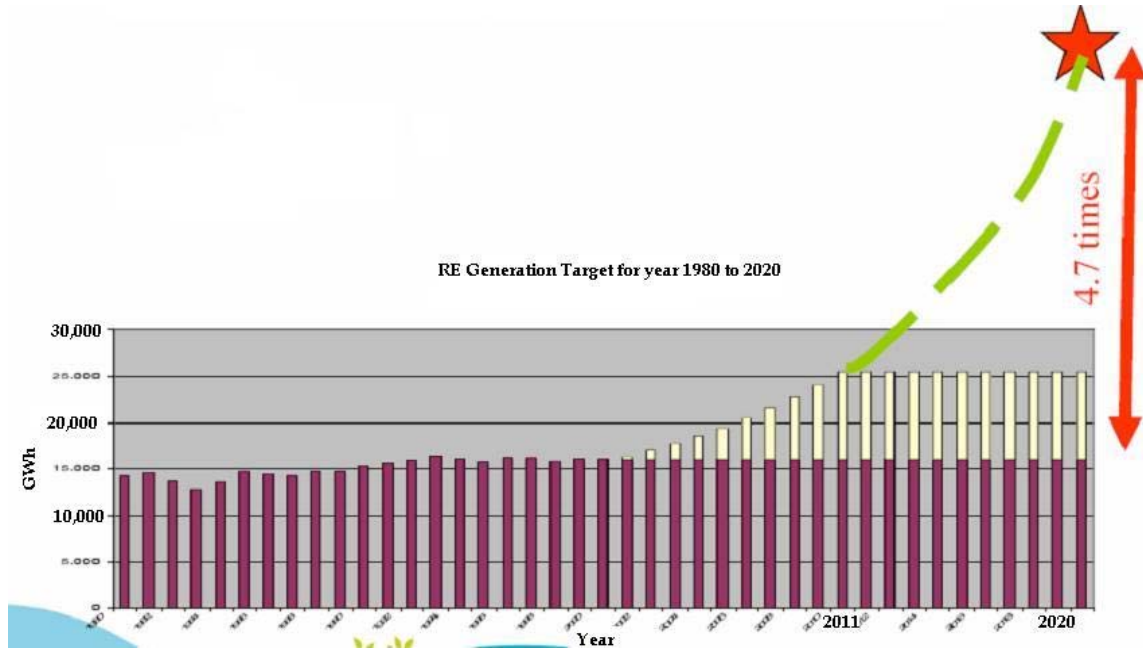
Fig.(5.3): Comparison of Year on Year Target with Actually Generated and Surrendered RECs <sup>12</sup>



Further, considering the repeating trend of accomplished target, year on year, the ORER has decided to increase its RE based power generation target uniformly over a period of 10 years till year 2020, to 4.7 times of the earlier target as shown in figure (5.4) i.e. to 45,000,000 MWh.

<sup>12</sup> www.orer.gov.au as on January 10, 2009

Figure (5.4): Increased year on year target till year 2020 <sup>13</sup>



Latest Amendments:

The ORER is working on a regulation for energy banding to selectively promote less mature RE technologies.

#### 6.4 Comparative Analysis of International Case Studies

Table (5.3): Sources which qualify as RE sources <sup>14</sup>

| Parameter                                   | UK ROC           | Australia REC    |
|---|------------------|------------------|
| Certificate denomination                    | 1 MWhe           | 1 MWhe           |
| Tradability feature                         | Yes              | Yes              |
| Implemented in                              | 2002             | 2001             |
| Sunset date                                 | Yes (March 2037) | Yes (March 2037) |
| Prior declaration of RPS Target till Sunset | Yes              | Yes              |
| Dynamic RPS Target (rising year after year) | Yes              | Yes              |

<sup>13</sup> www.orer.gov.au as on January 10, 2009

<sup>14</sup> RE based Certificate mechanisms of countries considered

|  |   |   |
|--|---|---|
| Approximate Price of Certificate (\$/MWhe)                 | 57  | 19  |
| Approximate Penalty against non compliance (\$/MWhe)       | Yes (buyout price)  | Yes (RE Shortfall Charge)                                       |
| Obligated Entities   | Electricity Supplier  | Whole sale purchaser of electricity                             |
| Whether participation is mandatory RE generators?          | Yes   | Yes   |
| Extension in Sunset date                                   | Yes (from Yr 2027 to 2037)                                    | No  |
| Increase in previously declared RPS target                 | Yes   | Yes   |
| Incentives to obligated entities for fulfilling RPS target | Some part of buy-out fund                                     | Some part of buy-out fund                                       |
| Banking of RECs  | Yes (1 year)  | Yes (no limit of duration)                                      |
| Energy Banding   | Design process completed and about to be implemented          | Most likely to get implemented in near future                   |
| Legal Framework for REC mechanism                          | Section 32 of the 1989 Electricity Act                        | RE Act 2000, and its amendments                                 |
| Legal/Regulatory tools used for revisions                  | Renewable Obligation Order                                    | Regulations   |
| Monitored by   | Office for gas and electricity market                         | Office of RE Regulator  |
| Role of Regulator  | Administers the REC Mechanism but does not regulate the price | Making policies and regulations but does not regulate the price |

## 6.5 Lessons Learnt from International Case Studies

This section summarizes the features of REC mechanisms from the case studies undertaken and identified potential challenges for REC mechanism to be implemented in India.

1. Prior declaration of long-term targets for Renewable Power Purchase Obligation has provide certainty to private investors in a regulated RE power market. In most of the countries, the sunset date of the scheme and final Renewable obligation target under REC mechanism has been declared at least 15 years in advance. The RE purchase targets for initial few years or for every year till sunset date are also declared at the time of introduction of REC mechanism. This strategy has reduced the risk perceived by private investors about off-take arrangements for RE projects.
2. Trading feature for REC ensures liquid market. This way issue of development of the least cost option for renewable energy is taken care of by the market for RECs.
3. Banding among the eligible RE technologies is a useful tool to improve competition among various RE technologies.
4. The regulatory framework, role of institutions and interplay with other regulatory instruments should be clearly specified.
5. No attempt should be made to regulate price of REC. Instead review of the REC market may be carried out to:
  - Identify key influencing factors for RE development
  - Evaluate trend in REC price movement & key drivers for price movement
  - Forecast likely composition of RE sources for fulfilling the RE obligation of obligated entitiesThis information may be used to tweak the targets without getting involved into direct price control.
6. It is important to ensure the liquidity, stability for long-term confidence of the private investors in REC market.
7. Prices of Tradable RECs reflect dynamic nature of market. It reacts to the changes in the generation costs, electricity prices and emissions allowance prices. However, some measures may be required to avoid the risk of excessive supply and collapse of REC prices.
8. The Government may be required to continue to support more expensive RE technologies.
9. Banding of RE technologies can be challenging if the generation cost difference between technologies is large.



## 7. Approach to introduce REC Mechanism in India

In Chapter 4, we identified the possible objectives for the proposed REC Mechanism in India. These objectives are reproduced below:

- a) Effective implementation of RPO mechanism
- b) Increased flexibility for participants
- c) Overcome geographical constraints
- d) Reduced transaction costs for RE transactions
- e) Enforcement of penalty mechanism
- f) Create competition amongst different RE technologies
- g) Development of all encompassing incentive mechanism
- h) Reduce risks for local distribution licensees

As mentioned in Chapter 4, it is felt that objectives 'a' to 'e' should take precedence over other objectives. In this chapter, an approach for introducing REC mechanism to address the above objectives within existing legal framework in India has been presented.

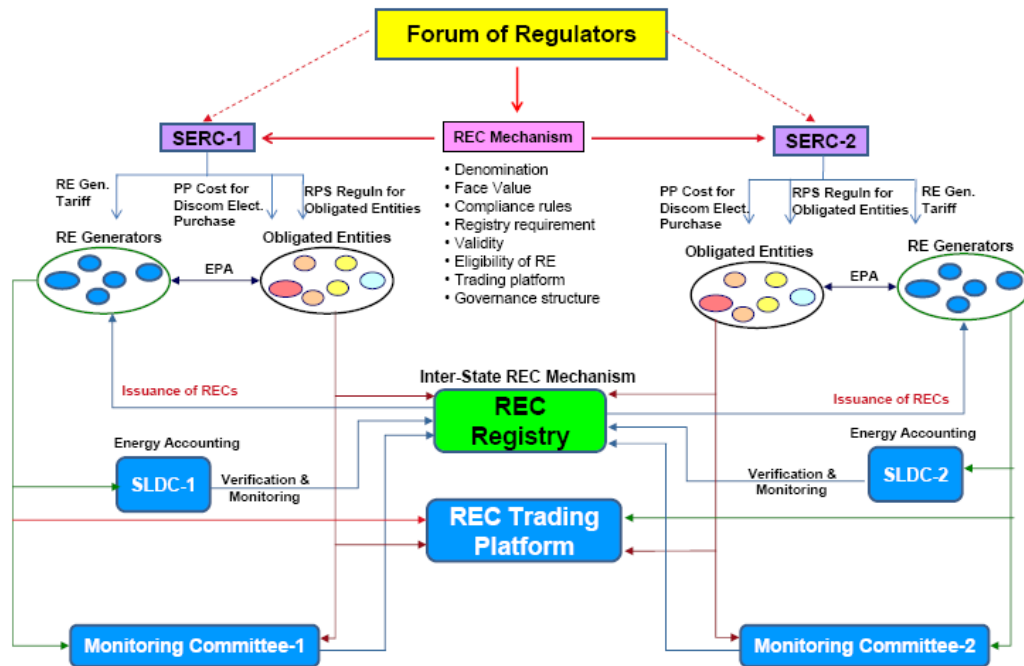
### 7.1 Proposed Approach

From analysis of international case studies and regulatory & legal framework in India and keeping in mind the most desirable objectives for the REC mechanism, it is obvious that uniform framework at national level is utmost desirable in order to derive maximize benefits from the proposed REC mechanism. However, promotion of renewable energy development is an important function within jurisdiction of the State Electricity Regulatory Commissions. The compatibility of framework amongst different States becomes critical if inter-State RE transactions are involved. Further, other regulatory instruments for promotion of renewable energy such as feed-in tariff mechanism are also expected to continue. While consistency in development of feed-in tariffs as well as development of obligations under Section 86(1)(e) is expected to evolve, it is necessary that any new mechanism is compatible and consistent with the existing regulatory framework and incentive structure for RE investors in India.

Accordingly, a detailed institutional framework has been designed to adopt the concept of REC mechanism in India. The proposed approach is presented in this section with its potential advantages. The prime focus while designing this approach has been to explore

the legally tenable and most practical REC mechanism for India. The Approach proposed in this Report can be better understood by the schematic shown in fig. (6.1).

Fig. (6.1): Proposed Approach for Conceptual Framework of REC



## 7.2 Description of the Proposed Approach

Under Section 166 of the Electricity Act 2003, the Forum of Regulators has been established. Further, Government of India has issued Rules, namely, Forum of Regulators Rules, 2005 notified on February 15, 2005 vide GSR no. 75(E), which mandate FOR to ensure harmonisation of regulation in power sector. In the proposed approach, it is envisaged that Forum of Regulators will develop the harmonized policy for implementation Renewable Energy Certificate Mechanism across India. The Policy shall be adopted by the State Electricity Regulatory Commissions in their respective States. RECs issued in the States which adopt the harmonized policy of the FOR shall be allowed in those States for compliance of Renewable Purchase Obligation under Section 86(1)(e).

Under Section 79 of the Electricity Act 2003, the Central Electricity Regulatory Commission is responsible for regulation of inter-state transmission and trading. Since proposed REC Mechanism is primarily envisaged for inter-state sales, common

institutional framework such as REC Registry and REC Exchange Platform shall be developed by the CERC. The same institutional structure may be used by the States for exchange of RECs among various players in the State. This will help avoid duplication of infrastructure required for implementation of REC mechanism.

RECs may be purchased by any person and not necessarily only by obligated entities. REC sell and purchase transactions may take place either on exchange platform or through bilateral contracts.

### 7.3 Roles and Responsibilities of Institutions

The above approach envisages additional role for various existing institutions as well as creation of new institutions. The proposed approach proposed creation of following new institutions:

- Monitoring Committees for each State participating in REC Mechanism
- REC Registry common for all States
- REC Exchange Platform common for all States

In the following paragraphs, roles and responsibilities of each institution have been discussed in detail:

#### 7.3.1 Ministry of New and Renewable Energy (MNRE)

MNRE, being the nodal agency for promotion of renewable energy in the country is primarily expected to facilitate the development of REC mechanism in India. Some of the activities which MNRE is expected to perform are listed below:

- To facilitate development of REC mechanism
- To provide support as desired by Forum of Regulators
- To approve technologies eligible for participation in REC Mechanism
- To assist SERCs in implementation of generation accreditation process
- To ensure that any future incentive mechanism for promotion of RE is compatible with the REC Mechanism

#### 7.3.2 Forum of Regulators (FOR)

Forum of Regulators is expected to play crucial role in design, development and coordination of implementation in various States participating in the REC Mechanism. In particular, FOR is expected to evolve consensus on following issues: viz.

#### Operating framework for REC Mechanism

- Standard Regulations under Section 86(1)(e) incorporating REC covering:
  - Institutional structure for REC Mechanism
  - Operating Framework for REC Mechanism
  - Methodology for pricing of electricity component
  - Methodology for pricing of REC component
  - Enforcement Principles for non-compliance of RPO
  - Generation accreditation process
  - Structure & Rules of the Monitoring Committee
- Development of standard methodology for energy accounting process
- Assessment of market for REC
- Review and comment on the Regulations developed by the CERC for REC Registry and REC Exchange Platform
- Periodic review of the development and implementation of REC mechanism
- Seek inputs from time to time from the MNRE and other stakeholders
- Resolve any issue which may crop up during implementation in any State

#### **7.3.3 Central Electricity Regulatory Commission (CERC)**

Under Section 79 of the Electricity Act 2003, CERC is responsible for inter-state transactions. Since, the proposed REC mechanism is expected to provide suitable platform for inter-state transaction in renewable energy, CERC is expected to develop appropriate institutional & Regulatory framework. In particular, CERC is expected to develop and implement:

- Institutional and Regulatory Mechanism for REC Registry
- Regulation for REC Exchange Platform
- Principles for determination of tariff for RE Technologies which may be used by SERCs for determination of pricing of RE in the State
- Develop criteria for eligibility of RE technologies for inclusion in REC mechanism in consultation with MNRE and FOR
- Approve RE technologies for inclusion in REC mechanism, in consultation with MNRE

#### **7.3.4 State Electricity Regulatory Commissions (SERCs)**

The Electricity Act 2003 mandates SERCs with the responsibility of promotion of renewable energy. While FOR may develop standard regulations, the SERCs are expected to play a crucial role in implementation of the REC mechanism. In particular, SERCs will carry out following activities:

- Adopt Standard Regulation developed by FOR after taking into account state specific issues
- Determination of RE Technology specific tariffs
- Determine the Tariff Rate for procurement of electricity component of RE
- Specify the RPS percentage and eligibility for RE procurement
- Specify enforcement mechanism for different Stakeholders for non-compliance
- Amend State Grid code to enable SLDC to take up energy accounting
- Amend Regulations under Section 86(1)(b) to account for acquisition of RECs
- Adopt with suitable modifications, regulations for monitoring committees
- Design Contractual framework between SLDC/ Distribution Company, RE Generator and Monitoring Committee for energy accounting
- Design Contractual framework between SLDC/ Distribution Company, Obligated entities and Monitoring Committee for energy accounting

### **7.3.5 State Load Dispatch Centres (SLDC)**

Energy Accounting would be the backbone of the proposed REC mechanism and the mandate for this important task under the Act is with SLDC. The procedure for energy accounting is usually governed by the State Grid Code. It is expected that SERCs will modify the State Grid Codes to enable SLDCs to undertake following functions:

- Accounting of renewable energy fed into the grid (electricity generated)
- Accounting of renewable energy procurement by the Obligated Entities
- Issuance of power generation certificate to REC registry
- Accounting of total energy procurement by all obligated entities

### **7.3.6 Monitoring Committee**

Monitoring Committee is one of the three new institutions proposed under this Conceptual Framework. The Primary Responsibility of the Monitoring Committee would be to monitor the compliance of the RPO by all obligated entities. This institution is expected to bridge the link between Central REC Registry and SERC. It is envisaged that Central REC Registry will notify the Monitoring Committee about the RECs redeemed by various entities in the State. However, it is possible that Obligated Entities are using renewable energy by way of:

- Procurement from the generators under contracts prior to the implementation of REC mechanism
- Procurement from the generators which are renewable but not eligible for RECs
- Off - site captive generation
- On site captive generation

In such cases, information about renewable energy will not be available with REC Registry. Some of the above mentioned information; particularly on-site captive generation may not be available even with SLDC. However, this generation will have to be accounted for monitoring compliance of the RPO. Monitoring Committee may have to evolve processes for collection of this data. Apart from this, the Monitoring Committee is expected to undertake following activities:

- Accreditation of eligible RE generators in the State
- Act as a repository of all information pertaining to renewable energy in the State
- Maintain database of Obligated Entities in the State
- Monitoring the compliance of Market rules by all stakeholders
- Reporting of non-compliance, breach of rules to the concerned SERC
- Enter into tripartite agreement with SLDC/ Distribution Company & RE Generator for energy accounting
- Enter into tripartite agreement with SLDC/ Distribution Company, Obligated entities for energy accounting

While this Study has identified the need of institution to undertake the abovementioned tasks, it is not clear whether any of the existing institutions can take up the responsibility to act as a Monitoring Committee.

### **7.3.7 REC Registry**

While Monitoring Committees will be formed in each State, REC Registry and REC Exchange Platform are proposed to be central institutions. The primary responsibility of REC Registry will be to issue Renewable Energy Certificates to eligible RE generators. The processes for energy accounting and REC issuance have been discussed in the next chapter. The REC Registry will also have to perform following tasks:

- Registration of eligible RE generators
- Registration of REC buyers which could be any person, obligated entity, trader or individual buyer who wishes to buy RECs to be carbon neutral
- Issuance of RECs to RE generators
- Redemption of RECs on receipt of redemption request
- Track transactions involving sell and purchase of RECs
- Provide requisite information to Monitoring Committee of each State on redemption of RECs by buyers
- Automatically redeem RECs if the life of the RECs is over



As in case of Monitoring Committee, this Report identifies the need for institutions to act as REC Registry and REC Exchange Platform. However, we have not identified any particular institution which may be able to perform the responsibilities of REC Registry or REC Exchange Platform.

REC Registry would be allowed to collect operating fees and charges as approved by the CERC from time to time. These operating fees and charges would be dependent on costs incurred on provision of hardware and software and to facilitate registration of entities, transactions, information exchange, and fulfilling its obligations towards reporting requirements. At this point of time, it is not clear how many States would join the proposed REC Mechanism and therefore it is difficult to estimate resultant volume for REC Registry.

#### **7.3.8 REC Exchange Platform**

REC Exchange Platform is expected to provide REC buyers and sellers a fair and transparent platform for sell and purchase of RECs. This platform will also help in finding out fair price of RECs in given circumstances. REC Exchange Platform is expected to undertake the following tasks:

- Development of hardware and software in accordance with CERC Regulations
- Facilitate exchange of RECs amongst interested parties in accordance with CERC Regulations
- Periodic reporting to the CERC regarding REC trades
- Recovery of costs from participants on the Platform

The platform would collect operating fees and charges as approved by the CERC from time to time. These operating fees and charges would be dependent on costs incurred on provision of hardware and software and to facilitate volume of transactions on the REC Exchange Platform. At this point of time, it is not clear how many States would join the proposed REC Mechanism and therefore it is difficult to estimate resultant volume. Further, it may be noted that several methods such as block bids, pay-as-you bid, of sell and purchase on Exchange Platform are possible. Further, periodicity of operation of exchange will have to be decided as REC market may not be liquid enough to operate on daily basis. It is necessary that method most suitable to meet the requirement is identified. Considering that this Report's primary purpose is to identify 'Conceptual Framework for REC Mechanism', we have not analysed this issue in detail. It is suggested that appropriate study may be undertaken to identify most suitable method





for Exchange Platform and to estimate the volume and cost associated with operationalisation of the Platform.

### **7.3.9 REC Buyers**

Worldwide awareness about the global warming and climate issues is increasing. As a result, many corporate as well as individuals prefer to purchase clean/ green energy. If such buyers are allowed to purchase RECs, market for renewable energy may increase significantly. Therefore, it is proposed that any person may be allowed purchase and redeem RECs. As the buyers purchasing RECs to satisfy RPO have been referred to as Obligated Entities, buyers without RPO may be called voluntary buyers.

All buyers whether Obligated Entities or Voluntary Buyers will have to be registered with the REC Registry. REC Registry will report redemption by Obligated Entities to the Monitoring Committee of the State where the entity is located. In case of Voluntary Buyers, their redemptions will be disclosed to the Regulator under Reporting Requirements to be specified by the CERC in its Regulations. Further, Voluntary Buyers will not have to register with the Monitoring Committee.

Apart from disclosure, both types of REC buyers will enjoy same rights with the REC Registry. Further, both Obligated Entities as well as Voluntary Buyers may carryout transactions through either bilateral contract mechanism or Exchange Platform.

### **7.3.10 Obligated Entities**

As mentioned earlier, Obligated Entities are a subset of REC Buyers. Unlike Voluntary Buyers, Obligated Entities must purchase defined quantum of renewable energy or REC to meet its obligation under RPO. Failure to meet RPO would attract enforcement charges. Obligated Entities can meet their obligation using any of the five methods discussed in section on 'Monitoring Committee'. Following shall be the responsibilities of the Obligated Entities.

- Register itself with Monitoring Committee and REC Registry
- Enter into contract with Generators for purchase of renewable energy and/or REC certificate for RPO compliance
- Redeem RECs at an appropriate time
- Furnish periodic reports to Monitoring Committee about their individual RPO compliance

- In case of shortfall in compliance of RPO, pay enforcement charge, as applicable and provide adequate payment security, as may be necessary.
- Enter into tripartite agreement with SLDC/ Distribution Company, Monitoring Committee for energy accounting and provide requisite information to Monitoring Committee from time to time.

### **7.3.11 RE Generators**

Upon implementation of the REC Scheme, RE generators would be of two types; eligible RE generators and non-eligible RE generators. Only those generators which employ technology approved by the CERC in consultation with MNRE would be eligible to participate in the REC scheme. All other generators, even if renewable will not be allowed to participate in the REC Scheme. It will not be mandatory for eligible RE generators to participate in the REC Scheme and the eligible RE generators will be allowed to sell renewable energy in any of the following combinations:

1. **Sale of electricity and REC to the local distribution company:** The RE generator may sell both electricity and REC component to the local distribution company under 'feed-in tariff' determined the Regulator. In such case, the REC Registry will issue RECs to the distribution company which may use the same to demonstrate the compliance of RPO or to sell in the market.
2. **Sale of electricity to local distribution company and RECs to any other entity:** In this option, the electricity will be procured by the local distribution company. Such procurement will be governed by 86(1)(b) of the Electricity Act. RECs shall be issued to the RE Generator which it may sell in the market.
3. **Sale of electricity to any entity other than local distribution company and REC to any entity:** The RE Generator may decide to sell electricity to any person subject to provisions of applicable Open Access Regulations and payment of relevant Open Access charges. The Open Access Regulations applicable in this case are the same as those applicable to any conventional generator. In this case, RECs will be issued to the generator which may be sold in the market.



Irrespective of the mode for sale of power adopted by the RE generator, it will have to perform following specific tasks:

- Register with SLDC, Monitoring Committee and REC Registry
- Enter into contract for sale of electricity and REC
- Enter into tripartite agreement with SLDC/ Distribution Company, Monitoring Committee for energy accounting and provide requisite information to Monitoring Committee from time to time.
- Notify Monitoring Committee about the nature of the contract
- Sell RECs during its life time

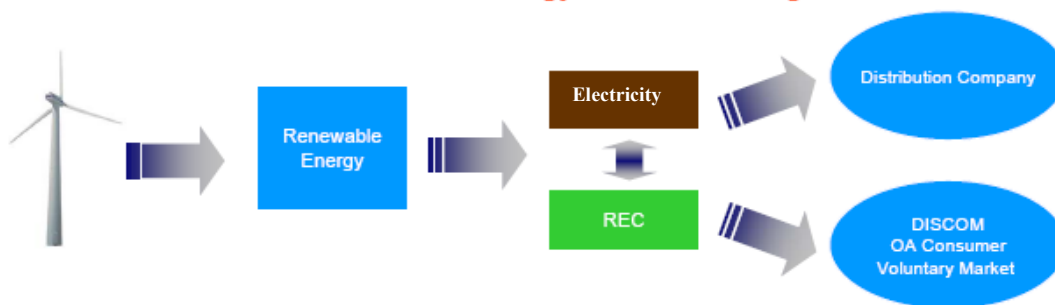
## 8. Conceptual Framework for REC Mechanism

Across the world, the core objective behind introducing REC mechanism is to promote generation of electricity from renewable energy sources. However, the guiding factors in designing the REC framework vary significantly across the countries. In Indian context, the objective of REC mechanism is to overcome the hurdles in harnessing the renewable energy spread non-uniformly across the States. With such specific requirement, it is necessary to discuss in detail the conceptual framework for REC mechanism in India.

### 8.1 Origination of REC concept

Renewable sources of energy are characterized as clean fuel or environmental friendly fuel because the electricity generated from renewable sources of energy does not degrade the environment. Therefore, electricity generated from RE sources can be divided into two components; electricity component and environmental component. The electricity component of RE can be considered comparable with the electricity generated from any other conventional energy source like coal, natural gas etc. However, the other component i.e. environmental component distinguishes the electricity generated from renewable sources from that of conventional sources. The environmental component associated with renewable energy can be carved out as a separate component and used for the purpose of REC mechanism while the electricity component can be transacted like transaction of electricity generated from conventional energy sources.

*Figure 7.1: Schematic of REC Origination*



The separation of REC component would make it governing factor in ensuring the RPO compliance by the obligated entities. As REC is only notional aspect or only a commercial mechanism for RPO compliance, it would not require creating any physical infrastructure for transaction of REC from one place to another. No inter-state or inter-regional transaction cost would mean that RE generator can sell its REC to any obligated

entity located in any part of country with no additional cost. Similarly, obligated entities shall have freedom to procure REC from the place of their choice.

Further, quantification of REC is foremost issue that needs to be addressed at conceptual level itself. There exist various options for quantification of RECs such as denomination in equivalent generation terms or in capacity terms or in currency terms. REC as a concept itself is linked with the generation of electricity therefore quantification also needs to be done in energy (MWh) terms. One REC will be issued for every MWh of electricity fed to the grid and metered at the bus-bar of the RE generator.

## 8.2 Schematic of the Proposed REC Mechanism

Over a period of time, the electricity sector has developed a well established institutional and operational structure at central level as well as state level for generation, transmission and distribution of electricity. However, REC mechanism is totally a new concept in electricity sector therefore the institutional as well as operational structure would need to be defined. Further, the structure should be such that it is compatible and could be operationalized in harmony with the existing framework. After due consideration of all these aspects, the schematic of operational framework for the proposed REC mechanism is shown in figure 7.2 and elaborated in the subsequent paragraphs:

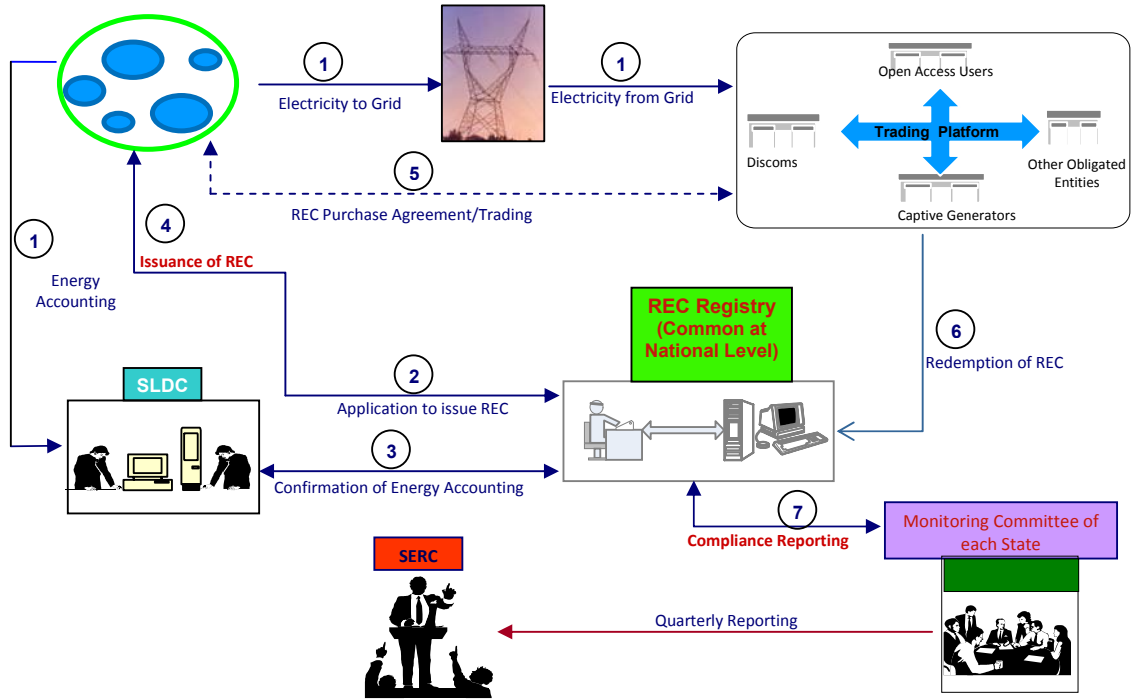
### **Step 1: Electricity Generation and Feeding to the Grid**

The electricity generated in RE project is injected into the grid. This electricity is consumed in real time by load prevalent in the system, which in turn is accounted against the consumption by the entities which had contract with that particular RE project. The metering of quantum of electricity injected into the grid and energy accounting will be done by the State Load Despatch Centre (SLDC).

### **Step 2: Request for issuance of REC**

The RE Generator will send a request to the REC Issuance Registry to issue the RE certificates equivalent to the amount of electricity injected into the grid and as certified by the SLDC.

Figure 7.2: Operational Framework of the Proposed REC Scheme



### Step 3: Confirmation of Electricity Generation

The REC Registry and SLDC shall establish procedure for exchange of information about actual electricity generated by registered RE projects on monthly basis. The SLDC shall submit the report for the energy accounts of RE projects to the REC Registry, as per established procedures on regular basis.

### Step 4: Creation and Issuance of RECs

Referring to the generation report submitted by SLDC, the REC Registry will create and issue appropriate number of RECs to the concerned RE Generator.

Further, in case, obligated entities have entered into long term contract with a RE generating station for purchase of both the electricity as well as REC, REC may be directly issued to the obligated entities on the basis of energy generation certificate and contract for such REC procurement submitted by the obligated entities.

### Step 5: REC Sale by RE Generator

Once the RECs are issued to the RE Generator, it can be sold to any buyer either by way of a bilateral agreement or through an aggregator. Further, sale/purchase of RECs

amongst various RE Generators / Obligated entities / Voluntary Buyers can be undertaken through REC Exchange Platform to be established in accordance with the Regulations to be formulated by CERC for this purpose.

**Step 6: Surrender/Redeeming of RECs**

The obligated entities can procure the RECs directly from the RE generator or from the market and need to surrender the RECs to the REC Registry to meet their RPS obligation. This will facilitate convenient and effective mechanism for ensuring the RPO compliance by the obligated entities. REC Registry shall maintain record of RECs issued and RECs received for redemption on regular basis.

**Step 7: Compliance Reporting**

REC registry will prepare a state specific and Obligated Entity Specific REC Procurement report on the basis of the RECs redeemed by each of the obligated entities and send it to the State level Monitoring Committee. In addition, the report will also provide the details of RECs issued to each of the RE generators in that State. Further, state level Monitoring Committee will verify the information provided in the REC Procurement report and provide the summary of status of RPS compliance of individual obligated entities in its State to the SERC on quarterly basis.

The above framework can be operationalized well within existing institutional and operational framework. It needs only two additional institutions i.e. REC registry at national level for issuance of RECs and Monitoring Committee at State level for monitoring the compliance of obligated entities.

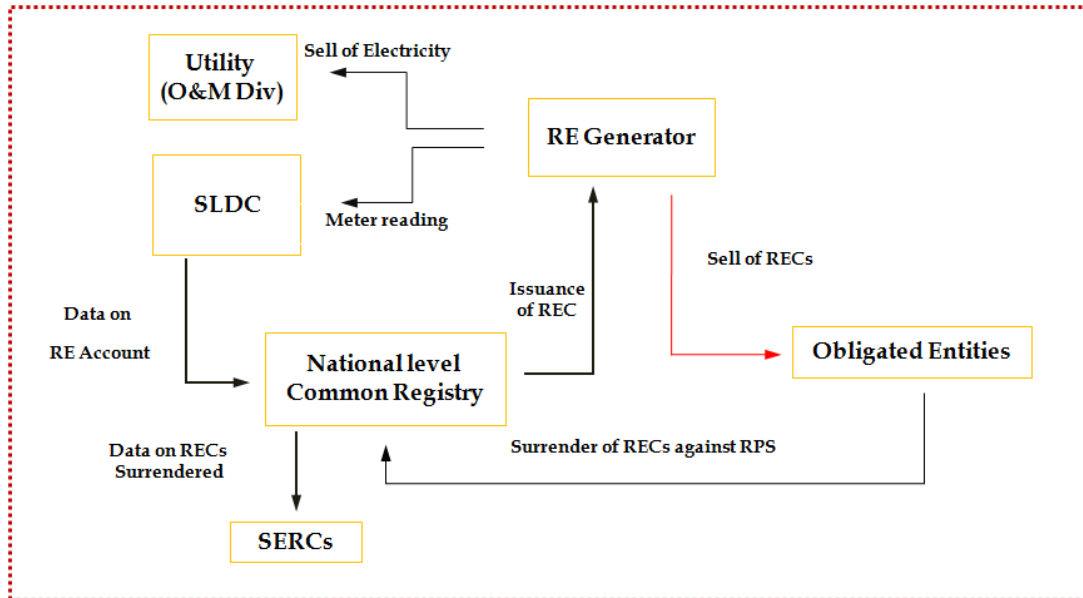
### 8.3 Operational Framework for the Proposed REC Mechanism

Having discussed the schematic of REC mechanism, it is equally important to understand the procedural framework for operationalisation of REC mechanism.

The operational framework can be broadly divided into four aspects:

- Energy accounting of RE generator
- Issuance of RECs to RE generator
- Procurement and surrender of RECs by Obligated entity
- Notification to the respective SERC about fulfilment of RPO of Obligated Entity

Figure 7.3: Operational framework of REC mechanism



### 8.3.1 Energy Accounting Mechanism to Create REC

Energy accounting for the proposed REC mechanism will not call for major modifications in the existing arrangement or creation of any new institution for energy accounting purpose. The existing framework can very well be used for accounting of electricity generated from renewable energy projects.

Currently, most of the renewable energy projects especially based on wind energy are directly connected with the state grid while some projects are connected at embedded level, local distribution licensee's network such as biomass power and SHP projects. However, most of the RE projects are not visible to system operator i.e. state load dispatch centre as these projects are not required to furnish the day-ahead generation schedule at individual project level. The energy accounting of RE projects is done by transmission/distribution licensee on the basis of joint meter reading taken by the representatives of transmission/distribution licensee and project developer.

The success of REC mechanism to a great extent will depend upon accurate metering and accounting of electricity generated by the renewable energy projects.



The SLDC, on monthly basis, will generate a report for energy injected by the RE Generator. The energy accounting report shall be prepared on monthly basis providing details of net energy injected into the system. The monthly energy accounting report prepared by SLDC shall work as generation certificate for the purpose for issuance of renewable energy certificate.

### **8.3.2 Procedures for Issuance of RE Certificates**

Once the energy generation certificate is issued, the RE generator would have to approach the REC registry for issuance of renewable energy certificates within the stipulated timeframe. The process at REC registry shall be completed in the following stages:

- Registration
- Request submission
- Verification
- Data recording
- Issuance of RE certificate

#### **Stage 1- Registration:**

For participating in REC mechanism, the RE generator must be registered with REC registry with separate registration for each RE project. Such registration would enable creation of a permanent account for purpose of keeping record of REC transaction by a particular RE generator separately for each of its RE project. The RE generator may need to provide the following details such as contact address, location, metering details, fuel sources, technology, installed capacity, start-up date. In turn the registry will issue a unique registration number to the individual generator. To control the volume of registered accounts, REC Registry may specify the validity period for such registered account. Further, the RE generator may register the different RE generation projects, for each RE generator of which energy accounting is separately done by SLDC, in a single account.

#### **Stage 2- Request submission:**

The registered RE generator would submit the request for issuance of REC on the basis of energy generation certificate issued by the state load dispatch centre.

**Box 7.1: Similarity of REC Registry with a Commercial Bank**

In the nature of operation, REC registry shall work very much similar to the work executed by any commercial bank. The customers willing to make transaction using the bank facility needs to open an account that hold the records of all transactions made by a particular customer. The account opening is done on the basis of criteria specified by the bank.

The specific requests made by the customers (like cheque clearance) are first verified by the bank and then, the request is processed by the bank. At the end, the bank debits/credits the customer's account accordingly.

**Stage 3- Verification:**

The REC registry will verify the request on the aspects of eligibility of RE technology, and period of issuance of generation certificate. REC Registry may decline such request if any of the criteria is not met.

**Stage 4- Data recording:**

REC registry shall maintain a database keeping record of all relevant information related to the RE generator identity, its project location, type of RE source, technology used, and date of electricity generation etc.

**Stage 5- Issuance of RE certificate:**

A unique number will be generated for a particular RE Certificate. RE certificate in electronic form shall be given to the RE generator. The same shall be updated in the account of RE generator.

**8.3.3 Procurement and surrender of RECs by Obligated entity**

The Obligated Entities that need to comply with RPO targets can procure REC issued to the RE generator either through the bilateral contract or through some market mechanisms. However, only procurement of such REC certificate shall not suffice for RPO compliance. The Obligated Entities shall be required to surrender the procured REC to the registry. The process of redemption of REC certificate is very much similar to the process of issuance of RE certificate. The process of REC redemption shall be completed in the following stages:

- Registration



- Request submission
- Verification
- Data recording
- Issuance of RE certificate

**Stage 1- Registration:**

For participating in REC mechanism, the Obligated Entities must be registered with REC registry. Such registration would enable a permanent account for purpose of keeping record of REC redemption by a particular Obligated Entity. The Obligated Entity may need to provide the following details such as contact address, location, nature of business etc. In turn, the registry will issue a unique registration number to the individual obligated entity. To control the volume of registered accounts, REC Registry may specify the validity period for such registered account.

**Stage 2- Request submission:**

The registered obligated entity shall submit the request for surrender of REC along with other related details.

**Stage 3- Verification:**

The REC registry will verify the request on the basis of period of issuance of RE certificate. REC Registry may decline such request if any of the criteria is not met.

**Stage 4- Data recording:**

REC registry will record all the relevant information related to the REC unique number, type of RE source, and technology used, date of RE surrender etc. in its database.

**Stage 5- Redemption of RE certificate:**

After verification and data recording, REC registry will credit the obligated entity's account with the equivalent amount of RE certificate redeemed by it.

**8.3.4 Notification towards fulfilment of RPO Obligation**

For ensuring the RPO compliance, the information related to issuance and redemption of RECs must be submitted to Monitoring Committees at State level. Therefore, REC Registry needs to submit such information in consolidated form giving details of quantum of REC redeemed by the Obligated Entities. For close monitoring of RPO

compliance, the REC registry shall submit such report on quarterly basis. Upon scrutiny and verification the report, Monitoring Committees may upload it on its website.

## **8.4 Participating Rules and Compliance Monitoring Process**

The success of REC mechanism will depend upon RPO compliance by entities, co-ordination among the agencies involved, prevention of any unfair practices etc. All such issues can be addressed by framing the rules on various aspects related to REC mechanism. At conceptual level, broad rules and principles can be formulated at FOR level while the rules for State-specific aspects of RPO compliance to be monitored by Monitoring Committee can be developed over a period during the operation period as and when need arises. Some of the broad aspects which can be covered at conceptual level are discussed below:

### **8.4.1 Generator Accreditation**

Prior to issuing the RE certificates, it is necessary to certify that the electricity is generated from a renewable energy source. The definition of renewable energy source is different from one scheme to another. Technologies such as Wind, Biomass and Bagasse, Small Hydro, Solar, Geothermal, Tidal are recognised to be renewable in nature across all the schemes. However, few States also recognise electricity generation from fossil fuel based cogeneration for the purpose of RPO compliance.

With Ministry of New and Renewable Energy (MNRE) being the nodal ministry for dealing with all matters related to renewable energy sources, the renewable energy technologies as approved by MNRE will have to be included in the accreditation process. Therefore, the energy generation from RE sources as approved by MNRE will be eligible for the participating in REC mechanism.

The Monitoring Committee will set out the accreditation criteria for RE generators. All rights to review and amend the accreditation process will be with the Monitoring Committee. The monitoring committee will notify for any proposed changes and amendments to the accreditation process, as and when required. The said changes and amendments will be finalised in consultation with the RE Generators. The RE Generators will be given reasonable time to adapt to the requirement modifications.

A RE generator is only eligible to qualify under the renewable energy certificate scheme, as long as it complies with the terms and conditions set by the Monitoring Committee. In



case of any changes, the RE generator must notify to the Monitoring Committee for the changes made or intention to make changes in the operation e.g. change in fuel source or capacity addition to the existing plant and submit the relevant documents to the Monitoring Committee for their verification and certification.

On a pre defined time interval, an independent auditor as approved by the Monitoring Committee may perform a technical audit of each of the eligible RE Generator to ensure continual compliance with the accreditation criteria set out by the Monitoring Committee.

#### **8.4.2 Reporting of Non-Compliance with the RPS**

The REC procurement report as submitted by REC Registry on quarterly basis shall form basis of RPO compliance report to be prepared by Monitoring Committees at each State level. Further, as outlined under Section 6.3.6, it is possible that Obligated Entities can meet their RPO obligation by way of REC purchase as well as renewable energy procurement from RE generators not eligible for REC, on-site/off-site captive generation etc. In such cases, information about renewable energy will not be available with REC Registry. Some of the above mentioned information; particularly on-site captive generation may not be available even with SLDC. However, this generation will have to be accounted for monitoring compliance of the RPO. Monitoring Committee may have to evolve processes for collection of this data.

Monitoring Committees will prepare consolidated statement of RPO compliance for each Obligated Entity on quarterly basis and also on annual basis at the end of each financial year. After verification by Monitoring Committee, the report shall be submitted to respective SERCs. The SERCs shall publish this report on its website along with giving the details of quantum of enforcement charge on each of the Obligated Entities for non-compliance with the RPO target.

#### **8.4.3 Preparation of Standard Documents**

In order to have a dispute free scheme in place, it is necessary that it should be governed by the strong contractual framework. Under the leadership of Forum of Regulators, the Monitoring Committee will facilitate the development of basic rules and minimum standards for contractual agreements to be followed by the Generators, Obligated Entities, Energy Accounting Agencies, and REC Registry.

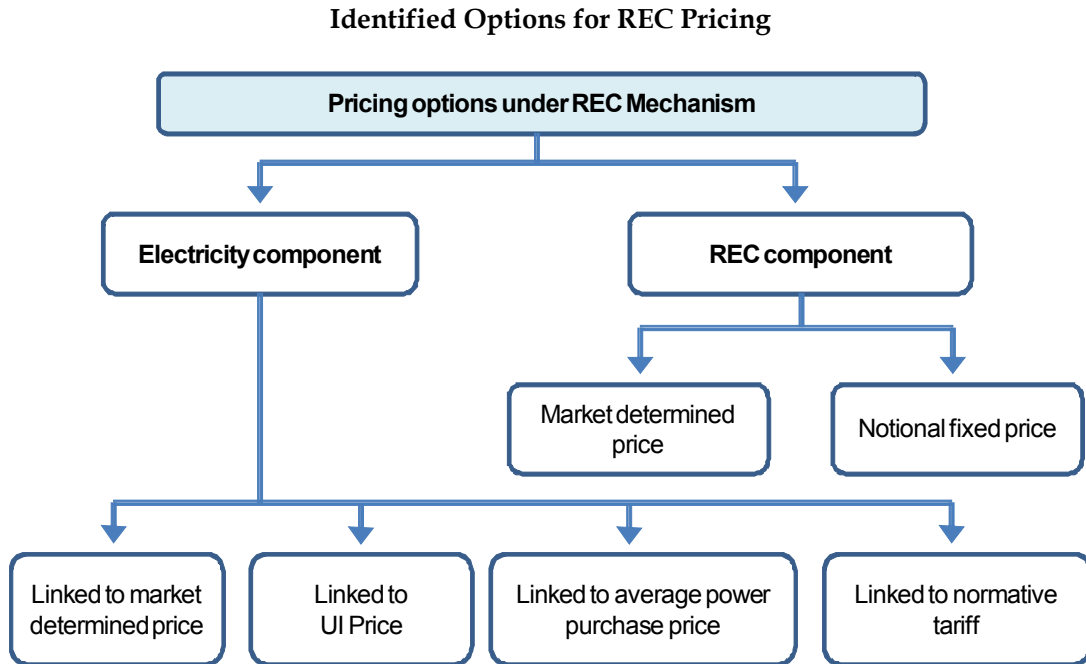
## **9. Pricing Options in REC Mechanism**

Pricing is one of the most important factors which influence the economics of operation of any commodity. Presently, prices for electricity generated by central sector generating stations, state sector generating stations are regulated by the Appropriate Regulatory Commissions through cost-plus approach. The tariff for power procurement by distribution licensee from renewable energy sources are also determined by the SERCs on the basis of preferential 'cost-plus' tariff approach.

With the introduction of REC mechanism, the renewable energy based generating sources would have two distinct products; electricity and REC. The suitable pricing mechanism for each of the component needs to be devised and it should also be compatible with the existing regulatory and policy framework. On the basis of this aspect, various alternatives for pricing of electricity and REC component has been shown in figure 8.1 which has further been elaborated in the subsequent paragraphs.

As shown in the figure (4.1), the energy generated from RE sources can be divided into two components; electricity component and environmental or 'Green' component. The electricity component of RE can be considered comparable with the electricity generated from any other conventional sources. However, the other component i.e. environmental component is the only factor which distinguishes the electricity generated from renewable sources from that of the conventional sources. Hence, it would not be unfair to allow a RE generator to sell these two as different products and have an additional source of revenue from RE project. Hence, it becomes necessary to identify the feasible methodologies for pricing each of these two components. This section covers the four different methodologies identified for pricing of the two components. Also, the feasible methodology has been recommended at the end.

Figure 8.1: Options for pricing of Electricity and REC Component



## 9.1 Options for Pricing of Electricity Component

As shown in figure (8.1), pricing of electricity component could be linked to following four options:

1. Market prices for electricity
2. UI Price
3. Average power purchase price of the distribution licensee
4. Normative or feed-in tariff for particular renewable technology

In the following sub-sections, these options and their merits and demerits have been discussed in detail.

### 9.1.1 Linked to Market Price

In a truly competitive power market, the prices of electricity are discovered through dynamics of the market operations. With regard to electricity, market price discovery has been done through the following two mechanisms:

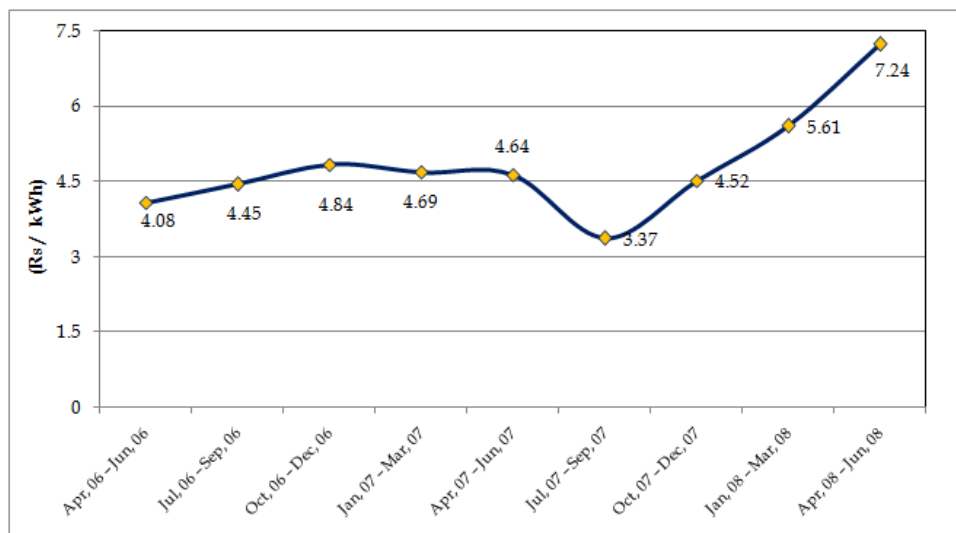
- Competitive Bidding Process
- Power Exchange



The price discovery through competitive bidding process reflects market price for electricity procurement under long term contract whereas price discovery through power exchange reflects market price for electricity procurement under short term contracts (on a day-ahead basis). The price discovery through competitive bidding process has two components viz. capacity charge and energy charge. Further, energy charge component is subjected to fuel cost adjustments with due escalation factors from time to time. Besides, due to case specific nature of competitive bidding projects, the price discovery reflects wide variation in tariff range. Considering the nature of electricity generation from renewable sources of energy, which is amenable to single part tariff component, the price discovery through power exchange will be more appropriate option.

The power exchange provides such platform for price discovery by matching demand and sale price, quoted by the buyers and sellers respectively. In India, two power exchanges have started their operations in recent past. The volume of electricity exchanged is very miniscule as compared to total electricity generation in the country. The average price variation in the power exchange on quarterly basis, for last two years, has been shown in the figure (8.2).

Figure 8.2: Weighted Average Sale Price of Traded Electricity (Rs/kWh)<sup>15</sup>



<sup>15</sup> Source: CERC Staff Paper on "Measures for restraining the prices of Electricity in short-term sale/trading" dated September 01, 2008

### Merits

- Adopting the philosophy of the power exchanges for determining price of electricity component would be appropriate as it represents short term marginal cost of electricity procurement in the market. Its usefulness has been successfully demonstrated for transactions of the conventional electricity in India.
- It will enable different RE sources and technologies to compete among themselves and with other conventional energy technologies.

### Demerits

- Significant demand-supply gap prevalent in the country poses restriction in true price discovery. The price discovered through power exchange in India which corresponds to < 0.5% of electricity generation in the country may not truly reflect the market price of electricity.
- The market discovered prices are reasonably higher than the cost of generation in case of most of the RE technologies and this would lead to artificial increase in power purchase cost of utilities for their RPS target which will ultimately burden the end consumers.
- Currently, the tariff for electricity generated from conventional as well as RE sources is determined through the regulated 'cost-plus approach' adopted by the appropriate Regulatory Commissions. Linking the energy price with market price does not fit into 'preferential cost -plus' structure specified by the SERCs for RE technologies.
- CERC has also expressed a concern over the steep increase in power exchange price without corresponding increase in commodity prices for fuel/oil/coal and inflation indices for equipment etc. Thus, pricing methodology based on exchange discovered price for pricing of electricity component from RE generation may be less acceptable by Commissions.

On the basis of above considerations, it would not be appropriate to link the electricity component price with market determined price in present scenario. However, with the development of market and maturity of RE technologies, this option can be explored.

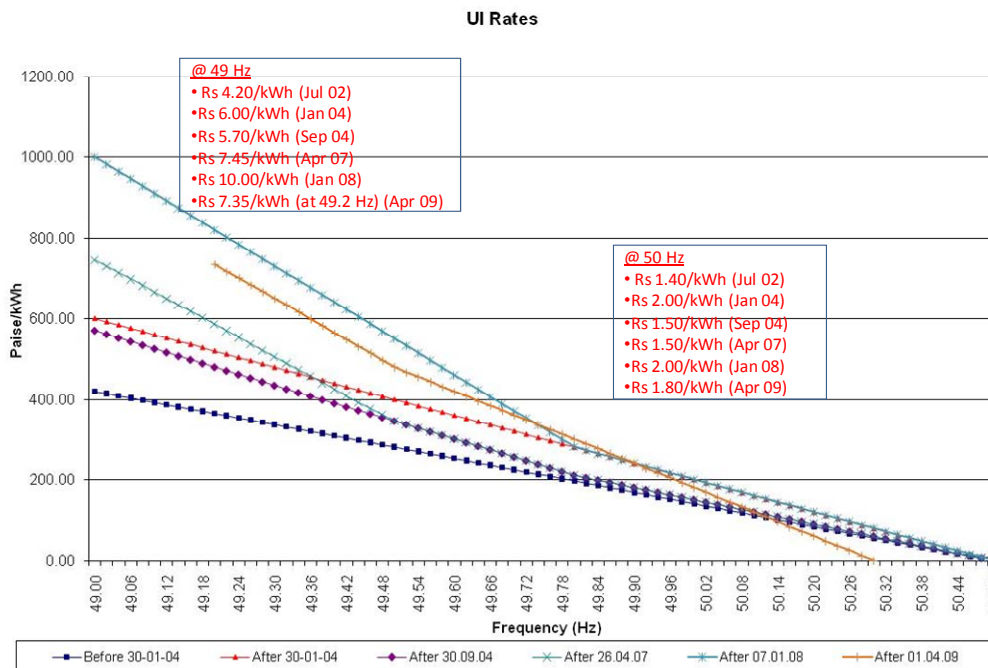
#### **9.1.2 Linked to Unscheduled Interchange (UI) price at 50 Hz**

In the present power system operations, the generators and beneficiaries/buyers are required to generate and draw electricity as per generation and drawal schedule

finalised by the appropriate load despatch centre. The deviation from the scheduled generation and drawal is governed through the UI mechanism under which rate of electricity has been linked with the prevailing grid frequency. The UI rates for inter-State operations are specified by CERC.

The electricity generation of RE sources predominantly represents non-firm nature of power therefore prices based on un-scheduled interchange may be considered one of the options for pricing of electricity. The UI price vector, as specified by CERC from time to time, is shown in the figure 8.3.

Figure (8.3): Unscheduled Interchange Price Vector <sup>16</sup>



### Merits

- Due to prevalent shortfall and nature of grid operations, average UI rates are very high than the rate for power procurement under any other power purchase mechanisms. If the electricity corresponding to REC is made to procure at UI rates, the revenue for the RE project is likely to be higher although it would be

<sup>16</sup>UI Prices has been notified by CERC, time to time, through 'Terms and Conditions of Tariff, Regulations' including amendments thereto. However, CERC has recently published the separate Regulations for UI charges. The new Regulations have been made effective from April 01, 2009.

uncertain. Alternately, the rate for procurement can be fixed at UI rate prevalent at 50 Hz.

#### **Demerits**

- UI Rate is essentially used as mechanism for grid balancing purposes and grid discipline purposes. CERC under its recent UI regulations have referred that UI mechanism should not be used as 'trading' mechanism. Hence, using it as a price settlement mechanism for electricity from RE sources may not be appropriate.
- Wide variation in UI volume and corresponding variation in the UI rate, may lead to additional un-certainty on revenue stream for the RE generators.
- The higher cost paid in power purchase will ultimately burden the end consumers.

UI price vector with its philosophy has been designed to undertake commercial settlement for deviation from the scheduled generation or drawal. Therefore, this mechanism can't be used for electricity component pricing of renewable energy.

#### **9.1.3 Linked to Average Power Purchase Price**

Under the current regulatory regime, the SERCs are required to regulate all sources of power purchase and procurement process of distribution licensee including the price of such power procurement.<sup>17</sup> Under regulated regime, the power purchase expenses are part of Aggregate Revenue Requirement (ARR) which SERCs approve before determination of retail supply tariff for a given financial year. The average power purchase cost based on recent Tariff Orders by concerned SERCs in respect of few distribution utilities in various States has been shown in figure 8.4

#### **Merits**

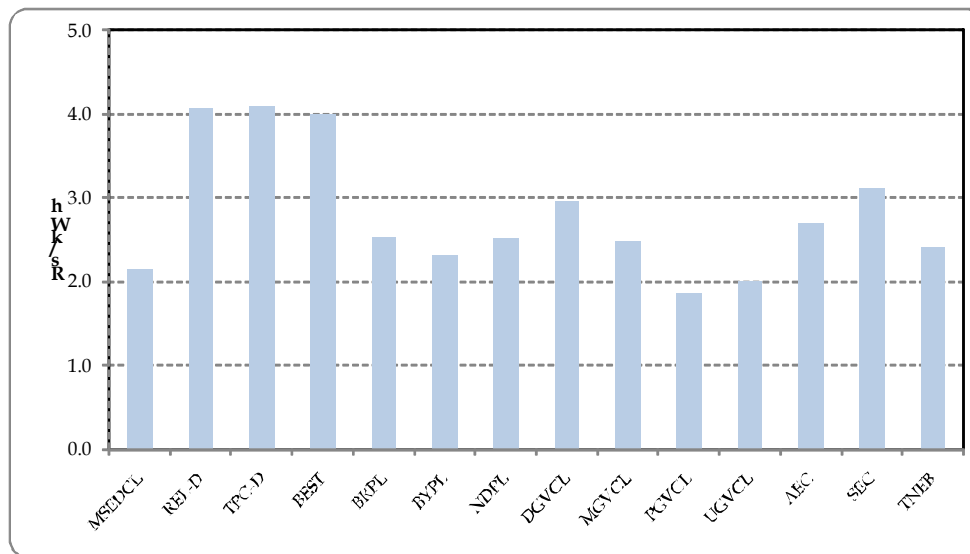
- The average power purchase cost reflects the pooled price of electricity purchased from all sources hence this methodology would be more appropriate as a benchmark for pricing of electricity component. This methodology will not unnecessarily burden the end consumers.

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<sup>17</sup> Section 86(1)(b) of Electricity Act, 2003

- The average power purchase information is available well before the commencement of Control Period therefore it will provide certainty to the project developer as well as distribution utility about the price of electricity component of renewable energy during ensuring year.

Figure (8.4): Average Power Purchase Cost (Rs/kWh)<sup>18</sup>



### Demerits

- It has been noticed that, while approving the power purchase expenses of a distribution licensee, some of the SERCs do not account their power purchase cost from short term sources, like traders and UI pool. In such situation, if a distribution licensee purchases significant amount of power from traders and UI pool, the actual average power purchase cost of a distribution licensee will be higher than their approved average power purchase cost approved by their

<sup>18</sup> The average power purchase cost for utilities, except TNEB, has been computed on the basis of power purchase expense and energy requirement approved by the SERCs in the ARR and Tariff Order for FY 2008-09. For TNEB, average power purchase cost has been calculated on the basis of data available in the book 'Statistics at a Glance' published by TNEB for FY 2007-08.

MS&EDCL, REL-D, TPC-D and BSET are distribution utilities in Maharashtra. DGVCL, MGVCL, PGVCL, UGVCL, SEC and AEC are distribution utilities in Gujarat. Average power purchase cost data for AEC and SEC have been taken from MYT Order for Torrent Power Limited (TPL). BRPL, BYPL and NDPL are distribution utilities in Delhi.

SERC. Hence in that case this methodology will not truly represent the appropriate benchmark for pricing of electricity component.

- Further, as evident from figure 8.4, the average power purchase expense varies considerably across the utilities within the State. e.g. within the State of Maharashtra and Gujarat, the average power purchase cost is significantly different across the utilities.

This Average power purchase approach may lead to a situation where RE project developer may trade-off better generation sites with the higher energy price, resulting into un-coordinated development of RE resources. Further, average power purchase cost is a dynamic figure, varies on the basis of power purchase mix. With these limitations, this mechanism may not be adopted for pricing of electricity component.

#### 9.1.4 Linked to Normative RE tariff

As per the principles outlined under Tariff Policy, the SERCs are required to specify the preferential tariff for power procurement by distribution licensees from RE sources. Due to small unit size and large number of RE generators, most of the SERCs, on the basis of representative sample study, have specified the normative tariff parameters and tariff thereof on the basis of representative sample study. In most of the cases, the tariff has been determined through cost-plus approach under which the SERCs have made assumptions for underlying tariff parameters like capital cost, plant load factor, O&M expense etc. The RE tariff across the selected States under study for different RE technologies have been summarized in the table (8.1).

Table (8.1): Renewable Energy Tariff across the States (Rs/kWh)<sup>19</sup>

| S. No. | Technology            | Delhi              | Maharashtra | Gujarat | Tamil Nadu |
|--------|-----------------------|--------------------|-------------|---------|------------|
| 1.     | Wind                  |                    | 3.50        | 3.37    | 2.90       |
| 2.     | Biomass               |                    | 3.11        | 3.08    | 3.14       |
| 3.     | Bagasse               |                    | 3.05        | 3.00    | 3.16       |
| 4.     | Small Hydro           |                    | 3.00        |         |            |
| 5.     | Solar (GBI Scheme)    |                    |             | 3.37    |            |
| 6.     | Municipal Solid Waste | 3.53 <sup>20</sup> |             |         |            |

<sup>19</sup> Renewable Energy Tariff Orders of respective SERCs

### Merits

- Linking the electricity component with normative RE tariff is most suitable approach from legal, institutional and operational perspective. It would lead to no change in the current tariff determination approach except for harmonization of some of the tariff principles across the States for providing the level playing field for various RE technologies.
- It will provide necessary certainty about the electricity price to the utilities as well as to the RE developers at the beginning of the Control Period itself.

### Demerits

- Currently, in all the States except Rajasthan, the RE tariff remains constant for the duration of Control Period, specified under the Tariff Order/Regulations notified in this regard. There is no review mechanism for review of normative tariff due to variation in underlying tariff parameters like capital cost, interest rate etc. Therefore, the normative tariff without in-built review mechanism may not necessarily reflect the actual cost and return specified under the Order/Regulations.
- For some of the technologies like solar and small hydro, the normative tariff has been specified after considering the subsidies/incentives announced by the Government. With the withdrawal of such subsidies/incentives, the actual cost of generation for these technologies would go up in comparison with their normative tariff.

## 9.2 Options for pricing of RECs

The REC pricing mechanism in India need to address unique situation where electricity market is still governed/regulated to great extent and the preferential feed-in tariff mechanism will have to continue as per provisions under Tariff Policy. Under the circumstances, REC price will have to be determined on notional basis, however, the same could be discovered through market mechanism based on volume and exchange of RECs. An analogy can be drawn in terms of pricing of equity shares during their initial public offer and afterwards their daily price discovery in stock exchanges. However, equity share pricing represents a price of commodity as going concern basis and their life corresponds to the life of the company which is not the case with the renewable energy certificate. At international level, the REC as a concept is used as incentive mechanism

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<sup>20</sup> DERC Order dated December 26, 2006 in the matter of Timarpur Waste Management Company (Pvt.) Limited



and cannot be relevant for pricing of REC in Indian context. In the present circumstances, any of the following two mechanisms can be explored for pricing of REC component:

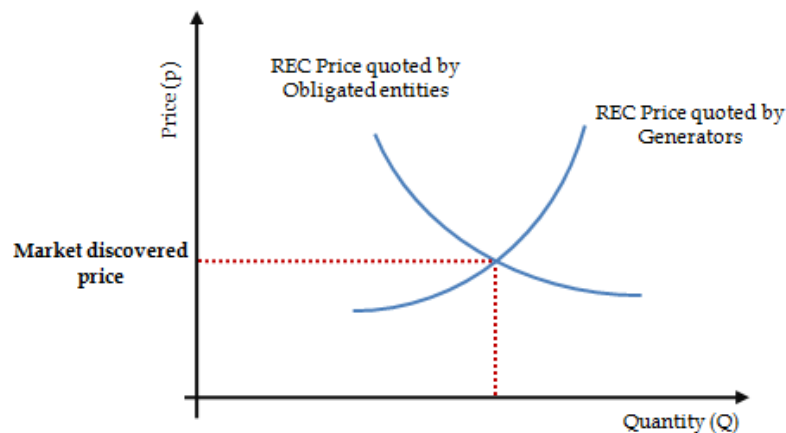
Similar to pricing mechanisms for electricity components, yet there is no established mechanism for pricing of environmental or 'green' component in the form of REC. For environmental component pricing, following two methods can be explored:

- Market discovered price
- Notional Fixed Price

### 9.2.1 Market Discovered Price

This approach is based on basic principles of Economics, price discovery through the market clearing price based on demand and supply curve. The balancing point of price quoted by RE generators and obligated utilities will decide the price of REC as shown in figure (8.6).

Figure 8.6: REC Price Discovery through market mechanism



#### Merits

- Price discovery through the demand-supply principles is an ideal situation for long term sustainability of any market. Such mechanism is already being used for price discovery of electricity in power exchange.

### Demerits

- As REC market is yet at concept stage/nascent stage of development, without adequate regulatory oversight and intervention measures, the pricing based on market may not be the best way to introduce REC mechanism.
- The primary issues such as minimum base price, suitable platform, minimum denomination etc will need to be addressed for market price discovery to emerge, which could be ideally addressed only after first few years of successful operation of REC mechanism in a closely monitored environment.

### **9.2.2 Notional Fixed Price**

Under this approach, some notional value can be assigned to REC component derived from its associated electricity. The REC component price can be specified in MWh terms which would mean that 1 REC will be issued for every one MWh of electricity generated from RE source and fed to the grid. It may become the most preferred option for introduction of REC mechanism in a tightly regulated market of India.

### Merits

- Sustainable methodology to introduce a completely new REC mechanism in India.
- Fair methodology to the generators and buyers because of which the end consumers will not get unnecessarily burdened due to high cost of power purchase for obligated purchase of renewable power.
- No apparent hurdles in switching over to a completely new methodology, if required, after REC market becomes more mature.

### Demerits

- This methodology leverages the exiting considerations used for deciding RE tariff and has no apparent demerit.

## **9.3 Recommended Methodology**

From the discussion in previous section about various approaches for pricing of energy component in the form of electricity, and environmental component in the form of REC, it can be concluded that the most feasible option for RE pricing is to link the electricity component with normative RE tariff and REC component with notional fixed price. Further, it is important to have focus on the basic purpose of introduction of REC

mechanism in India which is to facilitate the inter-State exchange/transactions of RE so that all the States will be able to meet the long term RPS target specified under National Action Plan for Climate Change (NAPCC). This purpose distinguishes REC mechanism proposed for India from that in most of the other countries which rather have their REC mechanism as an incentive mechanism. Therefore, the effective electricity component prices shall be net of notional fixed price for REC component.

$$\begin{aligned} \text{REC Component Price} &= \text{Notional Fixed Price} \\ \text{Electricity component Price} &= \text{Normative RE Tariff} - \text{Notional Fixed Price of} \\ &\quad \text{REC Component} \end{aligned}$$

The suggested approach seems to be the most feasible solution in the present electricity market scenario. However, with the progressive development of electricity sector, the pricing methodologies for Electricity component and REC component need to be reviewed at periodic interval. After attaining the maturity by RE technologies, both the prices should reach the level of price discovery through the commercial market for electricity as well as REC prices should be determined using market discovery mechanism.

The FOR Task Force on REC has supported the proposed approach for pricing of electricity component and REC component. However, it has also been suggested to ensure that the price of electricity component and REC component should be kept at reasonable level. The Task Force has further suggested that the concept of cost of generation has its relevance till such time the procurement of non-firm renewable energy is through competitive bidding. Hence due consideration should be given while devising the methodology for pricing the electricity component in the REC Mechanism.

In addition to the pricing, there are some more significant parameters to be taken care of while design of REC scheme. Various key design parameters have been identified and discussed in the next chapter.

## 10. Key Design Parameters of the Proposed REC Mechanism

Having discussed the basic framework for introduction of REC mechanism, it is equally important to discuss the parameters which would play important role while designing the detailed REC implementation roadmap. Though, at conceptual stage, it may not be appropriate to discuss all these parameters in detail but providing the basic concept for all these parameters would be of great help during later stage.

The following aspects related to REC mechanism have been discussed in this chapter:

- Eligible RE sources and technologies
- Eligible RE generator / Project
- Obligated Entities
- Banking period and Shelf life of REC
- REC Issuing Authority
- Compatibility with other incentive scheme
- Creation and retirement of RE Certificate
- Denomination of RE Certificate
- Period to issue RE Certificate
- Form of RE Certificate
- Trading mechanism for REC

### 10.1 Eligible RE Sources and Technologies

The term 'renewable energy' carries a broad meaning, and in general, it covers all sources of energy which could be replenished over a period of time. There has been difference of opinion among the various stakeholders for the energy sources that should be covered under the definition of 'renewable energy'.

The study of international practice reveals that sources such as Wind, Solar, Biomass, Landfill Gas, Municipal Solid Waste, Low Impact Hydro, bagasse cogeneration have been qualified as RE sources. Table 9.1 shows various sources which qualify as RE sources in selected countries.

**Table 9.1: Eligible RE Sources in Selected Countries<sup>21</sup>**

|                      | Denmark | Texas | UK | Sweden | Norway | Netherlands | Australia |
|----------------------|---------|-------|----|--------|--------|-------------|-----------|
| <b>Biomass</b>       | √       | √     | √  | √      | √      | √           | √         |
| <b>Solar PV</b>      | √       | √     | √  | √      | √      | √           | √         |
| <b>Solar Thermal</b> | √       | x     | x  | √      | √      | x           | √         |
| <b>Wind</b>          | √       | √     | √  | √      | √      | √           | √         |
| <b>Geothermal</b>    | √       | √     | x  | √      | √      | x           | √         |
| <b>Tidal</b>         | √       | √     | √  | x      | √      | x           | √         |
| <b>Wave</b>          | √       | √     | √  | √      | √      | x           | √         |
| <b>Ocean Thermal</b> | √       | x     | x  | x      | √      | x           | √         |
| <b>Small Hydro</b>   | √       | √     | √  | √      | √      | <15 MW      | √         |
| <b>Large Hydro</b>   | x       | √     | √  | √      | √      | x           | √         |

Further, there are varieties of technologies which can harness these RE sources and generate electricity. The vision of various countries differ on this aspect considering the availability of that resource and short term and long term impacts of leveraging that particular resource. For example, advanced gasification technology is preferred to co-firing while harnessing Biomass resource. Further, eligibility of small hydro technology is subjected to project capacity. For example, in Netherlands small hydro is considered up to project capacity of 15 MW, where as in ROC scheme of U.K. it is up to 20 MW, however in India the limit is up to 25 MW. REC scheme of Australia includes the domestic solar water heating also as an eligible RE technology but other countries do not.

In India, the wind, hydro projects up to 25 MW, biomass, bagasse cogeneration, MSW, solar PV and solar thermal etc have been described as renewable energy sources. The coverage of all these sources is based on the guidelines specified by the Ministry of New and Renewable Energy from time to time.

As MNRE is nodal ministry for all matters related to renewable energy, it would be preferable to include all the RE technologies as approved by MNRE under the REC mechanism. Further, in order to harmonise RE eligibility criteria across the States, FOR in consultation with MNRE may issue guidelines for eligibility of RE technologies.

In this regard, the Task Force has suggested that the electricity generated from schedulable RE sources may be excluded from the REC Mechanism and such generators should be free to sell electricity like any other generator. However, procurement of

<sup>21</sup> Final Report, Tradable Renewable Energy Certificate, Department of Minerals and Energy Pretoria

electricity from such sources would be acknowledged towards fulfilment of RPO. Though, ABPS Infra appreciates the logic behind such recommendations, we would not recommend such decision at this stage. It may be noted that REC Mechanism once established will be in place for 25 years. During this period, such issues are likely to come up. It is necessary to establish institutional process to resolve such issues as and when they arise. Therefore, we suggest that issue may be resolved by FOR in consultation with MNRE during operational phase..

## 10.2 Eligible Renewable Energy Generator/Project

In India, nature of operation of renewable energy projects varies across the technologies. Almost all the wind and small hydro based RE projects are grid connected, either directly or through the distribution licensee's network. While in some cases, the biomass and bagasse based projects operates on off-grid mode. Further, most of the solar projects currently installed in the country are off-grid projects, although recent initiatives by MNRE and significant developer interest is likely to see Grid connected Solar Power to be developed in big way. In the matter of specifying eligibility criteria for RE generators, three issues need to be addressed:

- Whether REC scheme should cover the only new projects, commissioned after the introduction of REC mechanism or existing projects should also be covered under this scheme?
- Whether grid connected or off-grid projects both should be covered under REC scheme?
- Whether participation in REC scheme should be made mandatory or it should be on voluntary basis?

In countries like U.K. and Australia, the date of commissioning of the project is used as a primary eligibility criterion. In addition, installed capacity of the project is the next immediate criterion which is used to assess the eligibility of a given RE project. Depending upon the RE resource and technology the threshold values of these two criteria differ.

### **ROC scheme of United Kingdom**

- All the RE projects, except hydro and co-firing, commissioned after January 1, 1990 are considered to be eligible RE projects. The consideration seems to

have been given by the regulator to protect the long term interest and faith of private investors of those RE projects, into U.K's ROC market.

- In case of hydro, project with installed capacity more than 20 MW is eligible as a RE generator, if it is commissioned after date of their first Renewable Order i.e. April, 2002, otherwise the hydro projects with installed capacity up to 20 MW are eligible RE projects
- Further, though U.K.'s ROC scheme will be operational up to year 2037, biomass based co-firing projects generating electricity will be eligible RE projects only up to March 31, 2011.

#### **REC scheme of Australia**

- All the RE projects generating electricity above the baseline as their power generation in year 1997.
- Power Plant Accreditation process for assessing the suitability of a given RE project has been detailed out which is used for yearly verification for eligibility of RE project.
- Domestic solar water heating systems installed after March 31, 2001 with capacity up to 10 kW, displacing electricity up to 25 MWh per year are eligible RE projects. However, these installations need comply with the standards released by the regulator.

In the international context it has been observed that all the new RE projects are eligible for their respective RE certificate market. Further, as shown in table 9.2, almost every country has mandated the new RE projects to participate in RE certificate market.

**Table 9.2: Inclusion of New RE projects in RE Certificate Scheme <sup>22</sup>**

|                        | Denmark   | Texas     | UK        | Sweden    | Norway    | Netherlands | Australia |
|------------------------|-----------|-----------|-----------|-----------|-----------|-------------|-----------|
| Mandatory or Voluntary | Mandatory | Mandatory | Mandatory | Mandatory | Mandatory | Voluntary   | Mandatory |

In India, extending the REC scheme to off-grid projects or to the small scale grid connected projects at this stage is not a feasible due to the following reasons:

<sup>22</sup> Renewable Energy Certificate Mechanisms of Respective Countries



- Challenges in energy accounting of the generated electricity due to lack of visibility to the SLDC. In such case, an independent metering arrangement will have to be put in place and a detailed verification system for such power generation will have to be institutionalized. At international level, net-metering facility was provided to account the energy generated by the small scale renewable energy projects.
- Otherwise it is challenging to quantify the quantum of electricity generated or displaced by off-grid technologies.

Considering the current status of infrastructure availability, it will be appropriate to focus and give priority to grid-interactive RE technologies only and based on the status after a few years the off-grid RE technologies may be included. This will enable the development of grid-interactive RE technologies up to commercial maturity and then such mature technologies can easily be transferred to the off-grid RE projects. Therefore, it is proposed that grid connected RE projects with 250 kW and above shall be considered eligible for inclusion in REC mechanism. The FOR Task Force has concurred with suggestion and recommended that the grid connected renewable energy generators of at least 250 kW should be allowed to participate in the REC mechanism.

Existing RE projects have already been covered under particular tariff and regulatory regime. Further, the long term contracts for the same are already put in place. Hence, it will not be appropriate to subject existing RE projects to be part of REC mechanism at this stage. During the deliberation with the FOR it has been agreed upon that the RE Generators already having PPA with the distribution licensee would not have option to participate in this proposed REC scheme till such time their PPA are valid. However, the new RE Generators which come into existence after the notification of this scheme by competent authority shall be eligible to participate in this scheme. The New RE generators shall have two options i.e. to sell both, the electricity component and REC component together at preferential tariffs determined by the respective SERC or to sell only the electricity component to distribution utilities and to sell the REC component through market mechanism to any of the obligated entities. Further, it is suggested that, if deemed appropriate, FOR may develop suitable methodology for inclusion of existing projects in REC mechanism after the expiry of their existing PPA. Further, all new grid connected RE projects, to be commissioned after introduction of REC mechanism, should be covered under REC scheme on mandatory basis.

### 10.3 Obligated Entities

Obligated entities in context of REC would mean the entities who would be subjected to the mandatory RPO specified by the Regulatory Commissions. The RPO has been an effective tool in ensuring the purchase of electricity generated from renewable energy sources but the entities that are covered under RPO target differ across the countries.

In the international context, two markets operate for purchase of RE certificate namely, 'Compliance' and 'Voluntary' Market. Under the compliance market, the energy supplying utilities are obligated to purchase the RECs. For Example, the UK ROCs places an obligation on all licensed suppliers to purchase a proportion of their electricity supply from renewable sources. However, under the voluntary market, consumers, primarily domestic and non-residential, purchase renewable certificates to offset the emissions contributed by them. The obligated entities variation in different countries have been summarised in the table 9.3.

**Table 9.3: Stakeholders with Renewable Power Purchase Obligation** <sup>23</sup>

|                            | Denmark  | Texas    | UK                             | Sweden            | Norway | Netherlands | Australia           |
|----------------------------|----------|----------|--------------------------------|-------------------|--------|-------------|---------------------|
| <b>Obligation on Whom?</b> | End User | Supplier | Supplier (Passed to Suppliers) | End Users < 10 MW | n.a.   | n.a.        | Wholesale Purchaser |

In Indian context, the RPO targets are governed by the framework provided under Section 86(1)(e) of Electricity Act 2003 under which the SERCs are required to specify the RPO target as a percentage of total electricity consumption in the area of distribution licensee. However, the interpretation of this clause has created ambiguity over the applicability of RPO targets to different entities. Most of the State Electricity Regulatory Commissions have made RPO targets applicable to distribution licensees while some SERCs have extended it to open access and captive users as well.

If RPO is levied only on distribution licensees and if eligible open access consumers are exempted, this may not be fair to non-eligible open access consumers of the distribution licensees due to the cost of RE procurement being borne by non-eligible open access consumers alone. The SERCs in Maharashtra and Rajasthan have applied the obligation to RE on open access and captive consumers to the extent of their outsourcing. The

<sup>23</sup> Renewable Energy Certificate Schemes in various countries

physical purchase of electricity from renewable energy sources by open access and captive users may be cumbersome due to the small quantity of RE purchase. With the implementation of REC mechanism, such entities can easily meet their RPO target just by purchasing the REC certificate.

In view of above aspects, it is recommended that distribution licensee, captive users and open access consumers should be considered as obligated entities for the purpose of RPO target under REC mechanism.

#### 10.4 REC Issuing Authority

The prevailing regulatory framework for renewable energy emanates under the provisions of Section 86(1)(e) of Electricity Act 2003 which empowers SERCs to take all suitable measures for promotion of renewable energy. Due to state specific provisions, the development of renewable energy is limited within the state boundaries. However, the RE transactions, in the form of unique REC, will involve stakeholders in different States and the existing established institutional framework may be found challenging to be leveraged to carry out the large number of tasks involved. Hence, for operationalising REC scheme, a national level entity needs to be created.

It has become apparent from the case studies discussed in chapter 5, that the single common body is convenient and cost-effective to closely monitor the REC issuance and redemption. The countries like Australia and U.K. have dedicated institutions such as ORER (Office of Renewable Energy Regulator) and OFGEM (Office for Gas and Electricity Market) respectively with an electronic tracking system, which avoids duplication in issuance of RECs. These case studies have been demonstrating the convenience and cost-effectiveness of single monitoring agency for issuance and redemption of RE Certificates, for a period of about a decade.

It is envisaged that India need to have a REC scheme common at national level. Further, for such common scheme, it will be convenient and cost-effective to monitor the life cycle of every REC, from its issuance to redemption, by a single institution common at national level. Following are the important aspects of such single institution.

- Single institution will avoid duplications and its other consequences such as disputes and significant resource occupation. In addition, the administrative

cost component of REC will be less in case of a single institution in comparison with that of with involvement of many inter-State institutions.

- Such unique institution can be termed as a 'REC registry' as mentioned in the chapter 6. Further, for more effective operations, REC Registry can be provided with an electronic tracking system to maintain and update the central database and will contain the record of issuance and retirement of REC.
- The registry will have following three primary functions.
  - Issue Certificates
  - Record Certificate Transactions and
  - Remove/Redeem/Retire certificates from the market at the request of or surrender by consumers

The REC Registry can be prescribed and appointed by the CERC under FOR guidelines/ rules.

### 10.5 Shelf life of REC

The shelf life of REC means the period during which a REC issued shall remain valid. It is proposed that shelf life of REC should be maximum one year. Keeping shelf life more than one year may result into accumulation of RECs by the stakeholders in the expectation of better price in future which may create artificial shortage of REC. The shelf life of more than one year may threaten the liquidity and viability of REC market in the short term. Therefore, it is proposed that shelf life of REC should also be of one year.

### 10.6 Denomination of Renewable Energy Certificate

In almost, all the existing RE Certificate schemes in different countries, the RECs are issued for a pre-defined quantum of electricity displaced or generated and fed to the grid. Typically this quantum has been denominated as one MWh. In certain schemes, where the voluntary market for REC exists, the RECs are issued in lower energy terms as well. Table 9.4 shows the denomination of RECs followed in various countries. In Netherlands, the RE certificates are issued with higher orders of magnitude such as 10 MWh, 100 MWh, and 1000 MWh.

**Table 9.4: International Denomination of RE Certificate<sup>24</sup>**

|                        | Denmark | Texas | UK | Sweden | Norway | Netherlands             | Australia |
|------------------------|---------|-------|----|--------|--------|-------------------------|-----------|
| Certificate Size (MWh) | 1       | 1     | 1  | 1      | 1      | 1, 10, 100, 1000, 10000 | 1         |

In almost all these countries renewable obligation is also defined by the regulator in terms of certificates to be purchased. Further as mentioned in chapter 5, many of these countries are about to go for 'energy banding', which will revise the REC denomination to some extent. As mentioned, less number of RECs will be issued per MWh of electricity generated/displaced using pre-declared mature RE technologies. 'Energy Banding' has not been proposed for India.

With the proposed denomination in energy terms, SERCs can continue to specify the RPO target as a percentage of energy consumption which can easily be converted into the equivalent number of RECs, by applying some conversion factor, required for achieving the RPO target.

### 10.7 Enforcement Charge for Non-Compliance

As mentioned in section 4.2 in chapter 4, the RE development in India has been limited by the fact that most of the SERCs have not provided for enforcement mechanisms against non-compliance of RPO target. Further, in cases where enforcement charge has been introduced, it is yet to be implemented. In doing so, the consideration has been given to the scarcity of the RE sources and supporting infrastructure. However, with new inter-State REC mechanism in place, the regional scarcity of RE will not limit the fulfilment of RPO target. Hence, then it would not be unfair to implement an effective enforcement mechanism across all the States for non-compliance of RPO target. However, during the discussion with the Task Force it has been recognised that, in depth consultation with SERCs to arrive at consensus in the matters of setting renewable purchase obligations and appropriate penalty for non-fulfillment of these obligations will be crucial for success of REC Mechanism. The Forum of Regulators should evolve state-wise targets for renewable purchase obligations after duly taking into account its recommendation of achieving the target of 5% RPO as a whole at national level and also the likely impact on consumer tariffs.

<sup>24</sup> Renewable Energy Certificate mechanisms in respective countries

Most of the international RE Certificate Schemes have strict penal provisions and penalty specified for non compliance of the renewable purchase target. From table 9.5, range of magnitudes of difference between average certificate price and the penalty price can be seen across the different countries.

**Table 9.5: RPO Non-compliance Penalty** <sup>25</sup>

(Prices are in US Dollar terms)

|                           | Denmark | Texas     | UK | Sweden | Norway | Netherlands | Australia |
|---------------------------|---------|-----------|----|--------|--------|-------------|-----------|
| Penalty/Buy-Out<br>\$/MWh | n.a     | 50        | 65 | 16     | n.a.   | n.a.        | 27        |
| Typical Price<br>\$/MWh   | n.a     | ~ 10 - 15 | 57 | 7      | n.a.   | n.a.        | 19        |

It has been observed that in markets where the certificate supplies are tight, RECs are traded for prices close to non compliance penalty. The penalty for failure to achieve sufficient purchase of renewable energy is essentially mandatory and simultaneously set the upper level for the price of a unit of renewable energy generated.

Considering the abundance of RE resources available in India, it would not be unfair to specify strong, transparent and non transferable penal provisions for non-compliance with RPS target. The quantum of penalty should be specified after validating the pros and cons of each option. If penalty is too small in comparison with REC price, the obligated entities would obviously opt to pay the penalty, instead of procuring RECs from the market. This scenario will make the RE development efforts futile. Further, if the penalty price is kept much higher than the REC price, the obligated entities will be vulnerable to the unfair practices in the trading market by RE generators. Hence it is necessary to decide the penalty such that it meets the objective of RPS compliance as well as protect the interest of obligated entities.

Further, it may be noted that since enforcement charge will have influence of the prices of REC, it is necessary that all States adopt same principles for determination of enforcement charge. Otherwise, depending upon the State and time of the year, the market will throw skewed prices for RECs.

<sup>25</sup> Renewable Energy Certificate mechanisms in respective countries



Considering all these aspects, it is proposed that Forum of Regulators can take up the task to develop the regulations under the provisions of Section 86(1)(e), Section 142 and Section 146 of the Electricity Act, 2003 to specify the enforcement charge for non-compliance of the RPO target.

The Task Force is in agreement with recommendations proposed by ABPS Infra in this subject matter and have suggested that appropriate penalties for non-fulfilment of RPOs are required to be incorporated by SERCs in their regulations and it is envisaged that FOR shall evolve harmonized approach for this purpose. The Task Force has also agreed on the recommendation that in order to have harmonised approach across the States, draft regulations under Section 86 (1) (e) of the EA 2003 shall be developed for adoption of the SERCs. It was also felt that amount of the penalty/non-compliance should be in addition to that provided under Section 142 (Punishment of Non-Compliance of directions by Appropriate Commission) of the EA 2003. However, it has also been suggested that the proposition of specifying the enforcement mechanism higher than that provided under Section 142 should be legally examined, separately.

## 10.8 Sunset Date of REC Scheme

The nature of promotional measures keeps on changing with the change in external and internal environment. In case of wind energy, the capital subsidy as announced by the Government during its early development stage has been withdrawn in a phased manner. The other scheme like RPO and preferential tariff may also be withdrawn after RE technologies attains maturity level. As any other scheme, the RE certificate scheme also need to have a sunset date to end the applicability of scheme.

The successful RE certificate schemes across the world have the feature of ex-ante declaration of sunset date of the scheme:

- The Australian REC scheme was announced in 2001 with its sunset date of March 31, 2021. In addition, approximate year on year target has also been announced a priori and revised on need basis.
- In case of UK ROC scheme was announced in 2002 with its sunset date of March 31, 2027. Further, through an order in 2009 this sunset date has been revised to March 31, 2037.
- In case of EU REC scheme the target of 20% has been declared to be achieved by year 2020.



India should also announced the sunset date of REC mechanism while its introduction. Considering the benefits of priory declaration of target and sunset date, the tightly regulated RE sector in India will be able to attract more private investments. Thus, it will stipulate the RE development. The REC sunset period should be specified after duly considering the following two aspects:

- Control Period
- Operative Period

The Control Period refers to the period during which underlying factors for the REC scheme shall remain valid. After the end of one control period, other control period having different REC design framework may be specified. The Control Period should be specified after taking care of gestation period of different RE technologies (varies from 1 year to 3 year). Therefore, the first control period may be of three years. At the end of 2nd year in first control period, the REC scheme should be reviewed to on the aspects of its effectiveness, change in economic conditions etc. Accordingly, necessary changes may be incorporated while specifying REC mechanism for next Control Period. Further reviews in the next control period may be taken up on need basis.

The operative period refers to the period during which REC scheme specified under a particular Control Period shall remain applicable to the projects commissioned during that period. The long operative period will provide certainty to the investors. The operative period may be linked to life of the RE projects which, in most of the cases, is approximately 20 years.

The consideration of sunset period at this stage should be on the basis that it should at least cover one Control Period and one operative period. Therefore, it is proposed that sunset period for REC mechanism should be of 25 years.

## 10.9 Compatibility with other Incentive Schemes

To a certain extent, the incentives and other benefits announced by the Government through various policy measures has been an important factor in ensuring the growth of renewable energy across the world. Almost every country, having some share of renewable energy, has provided incentives in the form of financial and fiscal benefits, preferential tariff, RPO etc.



At international level, almost every country has undertaken the analysis of interaction of the REC scheme with its other prevailing RE schemes. For example, to understand the complexities and compatibility, the European Commission Directorate has undertaken analysis of how the green and white certificates will impact the EU Emission Trading Scheme before allowing them to party the Emissions Trading Scheme.

In the proposed REC mechanism for India, RPO and preferential tariff has already been taken into account while detailing out the conceptual framework for REC. It is also important that REC should be compatible with other financial and fiscal incentive schemes already in existence or to be announced by the Government in near future. The Government has announced accelerated depreciation benefits, tax benefits, generation based incentives and capital subsidy to the renewable energy projects. Further, CDM benefit is also available to renewable energy projects. At present, all these incentives and benefits have direct or indirect impact on the normative preferential tariff announced by SERCs.

In the proposed REC scheme, no change has been suggested in the existing methodology used by SERCs for tariff determination hence there will be no impact of the proposed REC scheme on any of the existing incentive schemes and benefits etc.

### 10.10 Creation and Redemption of RE Certificate

Surrender/redemption of REC certificate completes the journey of REC certificate which started with its creation. Through, creation and redemption are two end events, but the process of creation and redemption of REC is almost same which has already been discussed in the earlier sections. However, there are certain issues which could arise due to unfair practices and therefore, should be taken care of during the process of creation and redemption of REC.

- Generation of multiple REC with one energy generation certificate to different parties
- Duplication of REC certificate
- Expiry of REC after retirement

In the international practices, the energy accounting institution communicates the certificate issuing registry about the metered power generation from every RE project



connected through its network. The issuing body creates number of certificates equivalent to the quantum reported to it and issues those certificates to the concerned RE project owner. When any entity wants to retire or surrender its certificate, the issuing body captures that transaction and annotates the certificate from their tracking system.

In case of India, the RE generators are either directly connected to the grid or through the network of distribution licensee. The energy generation certificate is to be issued to the REC generator therefore, it will be convenient to issue the REC directly to the concerned RE generator, and not to the host licensee except in cases where the licensee has already contracted for electricity and REC procurement with concerned RE generator. It will avoid creation of multiple numbers of RECs with one energy generation certificate.

Other issues can be very well addressed by using the appropriate hardware and software having compatibility to modify the processes, with the gain in operational experience. It is also suggested to issue REC only in 'electronic form' and no 'physical form' of REC has been contemplated to avoid hastles of paperwork and also in view of the fact that the security/verification protocols etc can be easily implemented in case of 'electronic form'.

### 10.11 Period to Issue REC Certificate

It refers to period within which the RE generator needs to apply for issuance of REC after getting the energy generation certificate from SLDC. There may be two options for specifying the period of issuance of REC:

- Monthly basis linked to energy generation certificate period
- At RE generator's choice within one financial year

As one option, the RE generator should apply immediately after receiving the energy generation certificate. It will ensure periodic generation of REC and in turn, better availability of RECs in the market. However, this process may be cumbersome if the quantum of energy generation is small as it will be adversely impact the working of REC registry and RE generator both.

As an alternative option, the RE generator may be given choice for availing RECs within one financial year. In such case, the RE generator will apply for REC once he has enough

energy generation certificates. However, it will create uncertainty towards availability of REC in the market and in such case, the possibility of price rigging by the RE generators or by any other person having significant quantum of RECs can't be overlooked.

In order to avoid oversupply or non-availability of RECs in the market, it is necessary that generators regularly apply for RECs. Therefore, it has been suggested to keep this period three months of the generation within which RE generator must apply for issuance of RE certificate.

### 10.12 Form of RE Certificate

RE certificate could be issued either in electronic form or in paper form (physical form). The electronic form of REC makes issuance and tracing of REC quite easier. Internationally, RE Certificates are issued electronically in almost every RE certificate scheme. However, few schemes also have the provision to issue the certificates in printed form when desired. Both the physical or electronic form of REC contains following information:

- Unique Certificate Number
- Name of the Issuing Body
- Generator Identity
- Born date of the Certificate
- Type of Generation Technology
- Installed Capacity of the Generator
- Location of the Generator
- Signature of the Authorized person

For India, electronic system is recommended for monitoring the life cycle of RECs. The electronic system has become a standard solution to maintain and retrieve a huge database and is a mature technology now. Due to the developments over past decade, such system will not involve very high initial investment and operation cost.

Proposed REC needs to contain all the information as mentioned in case of international RE certificate, in its electronic form. In addition following information may also be provided on the proposed RE certificate:

- Date of issues of the Certificate
- Validity of the Certificate



### 10.13 Sale and Purchase for REC

Underlying theme behind the REC Mechanism is to create market for renewable energy by breaking the existing barriers of state boundaries. With removal of geographical constraints, it should be possible to sell and purchase RECs in any State of the country. While large number of RECs will be sold and purchased through bilateral contracts, liquid market for RECs will help in identifying the most competitive sources of RE. In other countries like UK, Australia etc, the renewable energy certificates have trading feature. It is proposed that not only obligated entities but also other persons shall be allowed to buy RECs. While redemption of RECs by obligated entities shall be reported to monitoring committees, redemption by voluntary buyers will be reported to only Central Regulator. REC Exchange Platform is expected to provide the services for sell and purchase of RECs. While any trading platform could be used for exchange of RECs, at this point of time there is no clarity about the volume and liquidity in the market. It is suggested that FOR should undertake the assessment of market, liquidity requirements, costs involved in setting up of the market and necessary fee structure.

Further, REC Exchange Platform shall have to be developed and the regulations under Section 66 of EA 2003 will have to be framed to cover such exchange/transfer of RECs. These regulations should cover various aspects of REC mechanism such as registration of participants, operational rules, market monitoring, and to ensure the fair practices by the participants.

The Task Force has agreed with the proposal that 'one single market' shall be created in the country for exchange/transfer of REC. However, the difficulties/reluctance being observed on the parts of the States in creation of all India Electricity market for conventional power should be duly taken into consideration while designing the operating rules for exchange/transfer of RECs.

## 11. Way Forward

In this Chapter, we have presented the activities for implementation of REC Mechanism in India. It may be noted that these are primary activities and several secondary activities especially related to regulatory process may have to be undertaken at CERC and SERC level. These activities will vary depending upon the regulatory process followed by by CERC and SERC in each State.

| Sr. No. | Activity  | Responsibility   |
|---------|---|--|
| 1       | Standard Regulations for RPO under Section 86(1)(e)                                 | FOR to prepare and respective SERC to adopt  |
| 2       | Guidelines for determination of tariffs for renewable energy                        | CERC is in the process of developing tariff regulations for RE. As per S 61(a) SERC will be guided by these factors. |
| 3       | Standard Regulations for enforcement charge for non-compliance of RPO               | FOR to prepare and respective SERC to adopt  |
| 4       | Discussion Paper for REC Registry   | FOR to prepare and CERC to adopt   |
| 5       | Discussion Paper on REC Exchange Platform, REC Market Assessment, and fee structure | FOR to prepare and CERC to adopt   |
| 6       | Regulations for REC Registry  | CERC to prepare and adopt  |
| 7       | Regulations for REC Exchange Platform   | CERC to prepare and adopt  |
| 8       | Discussion Paper on structure, role and rules of the Monitoring Committees          | FOR to prepare and CERC to adopt   |
| 9       | Development of process for approval of eligible RE technology                       | FOR to develop in consultation with MNRE   |
| 10      | Development of Generation Accreditation Process                                     | FOR to prepare and respective SERC to adopt  |
| 11      | Appointment of REC Registry   | CERC to prepare and adopt  |
| 12      | Appointment of REC Exchange Platform  | CERC to prepare and adopt  |
| 13      | Approval of rules / bye-laws of REC Registry  | CERC   |



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|----|--|--|
| 14 | Approval of rules and bye-laws of REC Exchange Platform                                    | FOR/CERC   |
| 15 | Discussion Paper and Standard Amendments to existing Grid Code to enable energy accounting | FOR to prepare and respective SERC to adopt        |
| 16 | Appointment of Monitoring Committee  | SERC to appoint Monitoring Committee in its State. |

Further, several other activities such as development of hardware and software by REC Registry and REC Exchange Platform. The Regulator may have to approve the specifications as well as audit the system. Similarly, Monitoring Committee will have to develop database of all renewable energy installations in the State. This Activity would require significant upfront effort. Such preparatory activities have not been considered in the above activity table.

Similarly, significant capacity building activity will have to be undertaken at the State and Central level. These capacity building activities have not been considered.